ESSAYS ON HORIZONTAL MERGER SIMULATION: THE CURSE OF DIMENSIONALITY, RETAIL PRICE DISCRIMINATION, AND SUPPLY CHANNEL STAGE-GAMES

A Dissertation

by

GEOFFREY MICHAEL POFAHL

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2006

Major Subject: Agricultural Economics

ESSAYS ON HORIZONTAL MERGER SIMULATION: THE CURSE OF DIMENSIONALITY, RETAIL PRICE DISCRIMINATION, AND SUPPLY CHANNEL STAGE-GAMES

A Dissertation

by

GEOFFREY MICHAEL POFAHL

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Approved by:

Chair of Committee,	Oral Capps, Jr.
Committee Members,	George C. Davis
	H. Alan Love
	Steven L. Puller
Head of Department,	John P. Nichols

December 2006

Major Subject: Agricultural Economics

ABSTRACT

Essays on Horizontal Merger Simulation: The Curse of Dimensionality, Retail Price Discrimination, and Supply Channel Stage-Games. (December 2006)

Geoffrey Michael Pofahl, B.S., University of Utah, Salt Lake City

Chair of Advisory Committee: Dr. Oral Capps, Jr.

In the words of Joel I. Klein, former Assistant Attorney General of the United States, "[a]ntitrust enforcement in the merger area has never been as time-consuming, complex, or as central to the functioning of our economy as it is today" (Klein, 1998). As such, the development of transparent, efficient, and accurate merger analysis tools is an endeavor whose value continues to increase in the eyes of regulators and industry participants alike. Arguably, the most visible result of such endeavors is the emergence and advancement of a practice known as merger simulation.

The first goal of this dissertation is to evaluate the merits of the Distance Metric (DM) demand model and its usefulness in merger simulations. Revered by its creators as easy-to-use, flexible, and able to handle large numbers of products, the DM approach has not received the "road-testing" necessary for establishing its practical usefulness. The DM model is used to estimate demand elasticities for 45 bottled-juice products. Elasticities are then used to simulate numerous hypothetical mergers. While adding validity to the alleged strengths of the DM approach, an additional contribution is made by demonstrating the robustness of merger simulation results across 22 DM specifications.

Despite the oft-recognized reality of zone pricing by food retailers, this form of price discrimination has received little attention within the context of upstream merger analysis. Thus, the second objective of this dissertation is to relax the conventional merger simulation assumption of uniform pricing by retailers, allowing us to explore the impacts of zone pricing on post-merger price effects. Using the ready-to-eat cereals industry as a backdrop, it is shown that ignoring retail price discrimination veils a potentially diverse set of price effects that are otherwise lost in uniform pricing analyses.

The goal of the final essay is to explore the implementation of more realistic supply channel interactions in merger simulations. In particular, a two-stage pricing game is used to conduct merger simulations in the refrigerated orange juice category. The overriding finding is that comparisons with conventionally used models will not be practical until the relationship between demand specification and two-stage game modeling is better understood.

To

Rebecca

ACKNOWLEDGEMENTS

First and foremost, I would like to acknowledge and thank my wife, Rebecca, for her unwavering support throughout our marriage. I wish there were an award or some sort of formal recognition for all of the work that she has done to help me over the years. Although I am the one that often gets a "pat on the back" from family members, old friends, teachers, and complete strangers for pursuing an advanced degree, in many ways it is quite difficult for me to take full credit for any achievements I have made. While Rebecca will gladly admit that she has never had the pleasure of doing my homework or taking a test for me, there are so many things that she has done that made my performance of those tasks much easier. I also appreciate her willingness to take an interest in the work that I do; she doesn't even flinch when I talk about things such as utility maximization, discrete-choice-models, horizontal mergers, or probability distributions. Finally, I am indebted to her for the great service she has, and is, performing as a wonderful mother to our two children. While I spend my days learning about industrial organization and demand analysis, she spends hers teaching two young children how to grow up to be kind and responsible individuals. Her focus on home life and our children has been a major blessing in helping me to stay grounded in the things that are really important in life (and I'm not talking about economics).

Next, I want to thank my children, Grace and Preston. While most of my colleagues know me during the day as Geoff Pofahl, a mild-mannered economist, they may be surprised to find out that by night (actually by evening to be more precise) I am a handsome prince by the name of Eric, Philip, Alladin, or Beast, or I'm Peter Pan, or a bear, or a horse, or a monster, or a dragon. I go on bear hunts (or am the bear being hunted), fight other wild creatures and foes, and have saved many princesses in the last two years. Gracie has the most wonderful imagination and I thank her for including me in her adventures. I also thank her for taking interest in what I do. She is always excited to come to school with me and to help me with my work. She even made a noble effort to say "Ecun….omics" when she first started to talk (that was a very proud day). Preston has been a huge blessing as well. I am grateful for all of the wrestling we have been able to do. I'm also glad that I can count on him to free my mind from the residual cobwebs of a day's work by occasionally smacking me on the head (for some reason he likes to drum on my head…let's hope it's a short lived phase…he's getting stronger). In addition, I am grateful for the chance to construct train-tracks, play with toy cars, build super lego towers, and to throw balls in the house.

The rest of my family deserves much thanks as well. I am thankful to my parents, Bill and Laurie Pofahl, for their encouragement, advice, and love. With respect to this dissertation, I'd like to add a special thanks to my father and older brother, Ehren, for assisting me in the collection of bottled juice attribute data. I would also like to thank my wife's parents, Jon & Audrey, for their support and motivation.

I am grateful for my major advisor and committee members. I could not ask for a better major professor than Dr. Capps. He has been an incredible mentor and friend. I appreciate his "the glass is half-full" perspective on life and the positive reinforcement he has always sent my way. He has always been there when I needed someone to bounce ideas off of. But he has also given me liberal amounts of freedom in the pursuit of my degree. I also appreciate his kindness to my wife and children. We thoroughly enjoyed the opportunities to hang out at the Capps' house during those much-needed football weekends.

I thank my committee members, Dr. George C. Davis, Dr. H. Alan Love, Dr. Steven Puller, and Dr. Timothy Richards. I am also indebted to Dr. Leatham and Vicki Heard for providing me with so much good advice and guidance in directing and completing my degree requirements…thank you.

I am also grateful for my classmates and department friends; Senarath, Aaron, Brandon, Darmawan, Jun, Moonsoo, Grant, Matt, Wendy, Yan, Yingning, Kara, Gayaneh, Megha, Jared, Hwa, Gabriel, George, and Pablo.

TABLE OF CONTENTS

Page

Page

LIST OF FIGURES

Page

Page

LIST OF TABLES

Page

INTRODUCTION

Weekly, if not daily, business media is riddled with news of mergers and acquisitions: “F.T.C. Moves to Stop $2.8 Billion Ice Cream Deal” (Day, 2003); “Government Regulators Approve Nestlé’s Purchase of Dreyer's” (Ho, 2003); “Kraft Foods Will Sell Altoids And Life Savers to Wrigley” (Warner, 2004); “Justice Dept. Agrees Whirlpool Can Buy Maytag” (CNN, 2006). Whether motivated by mere survival instincts, investor relations, production efficiencies, or market domination, the alliance of two or more business entities that would otherwise compete for market share is a practice that plays a significant role in the American economy. As such, this practice, formally known as a *horizontal merger* (Werden, 1997), has received much attention from regulatory authorities at the U.S. Federal Trade Commission (FTC) and Department of Justice (DOJ). In the mid-1990s, motivated by a desire to provide consistent, transparent, and timely horizontal merger analysis, these agencies (particularly Gregory Werden at the DOJ), as well as other economists (e.g. Hausman, Leonard, and Zona, 1994), developed a somewhat radical new method for investigating the potential effects of a horizontal merger. This method has become known as *Horizontal Merger Simulation*.

This thesis follows the style of the *RAND Journal of Economics.*

As the “new kid on the block” of merger analysis, the potential contributions of merger simulation have been elevated by some and diminished by others (Woodbury, 2004). Within an environment of legal maneuvering and regulatory debate, merger simulation has emerged as a much talked about and highly utilized tool for analyzing the potential effects of proposed horizontal mergers. Though it has gained in popularity, there is still much debate and research to be done before the contributions of merger simulation are fully known. Within this context, the purpose of this dissertation is to address several issues that have received either unsatisfactory attention or absolutely none at all in the published literature. More specifically, the following three papers will be presented, all within the context of a *differentiated*[1] product industry: 1) Distance Metric Demand Modeling and Simulated Mergers in the Bottled Juice Category, 2) Retail Zone-Pricing and Simulated Price Effects of Upstream Mergers, and 3) Supply Channel Stage-Games and Horizontal Merger Simulation.

Before providing a brief introduction to each of these papers, it is important to establish the context from which these topics gain their importance. Therefore, this introduction will proceed as follows. Part 1 provides background material including a brief review of the emergence and evolution of merger simulation research. Part 2 introduces the basic steps of all merger simulation studies. Parts 3–5 summarize and outline the motivation for and the contributions of the forthcoming papers. Part 6 outlines the complete dissertation.

[1] Mergers involving homogenous product industries will not be considered in this dissertation.

Background

Introduced in 1914, Section 7 of the Clayton Act provides the primary motivation behind all regulatory injunctions and investigations of proposed mergers over the past 92 years. Section 7 states:

> No person engaged in commerce or in any activity affecting commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person subject to the jurisdiction of the Federal Trade Commission shall acquire the whole or any part of the assets of another person engaged also in commerce or in any activity affecting commerce, where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly

Given that the "enemies" of Section 7 are anti-competitive mergers, a natural question arises: How is an anti-competitive merger identified a priori? This "million-dollar" question is the catalyst behind a vast body of research aimed at identifying and analyzing problematic horizontal mergers.

Traditional merger policy (hereafter referred to as structural[2] merger analysis) can be couched within a framework known as the "Structure-Conduct-Performance" paradigm (see Church and Ware, 2000; Kadiyali, Sudhir, and Rao, 2001; and Werden, 1996). The basic idea is that there is a causal relationship flowing from the structure of a market to the conduct of the market and finally to the overall performance of the market (Church and Ware, 2000). Initially, this idea was easy to support as the relationship

---

[2] This language is consistent with the literature and is used because structure is the only 'observable' component of the SC in SCP, that can be used to infer anything about potential performance.

between market concentration and performance has been well established in economic theory. Oligopoly theory clearly predicts that, ceteris paribus, there is a positive relationship between market shares or concentration and market power exertion (Tirole, 1988). More specifically, as a firm's share of the market increases (a change in market structure), oligopoly theory predicts reductions in output corresponding to higher prices (a change in market conduct), resulting in a transfer of welfare from consumers to firms (a change in performance), all other factors held constant (Tirole, 1988).

Given the theoretical relationship between market concentration and conduct, traditional[3] evaluation of horizontal mergers, as established by case law and agency (FTC and DOJ) guidelines, has primarily focused on the use of market structure indicators, in conjunction with information on entry feasibility, to predict the conduct implications of a proposed market alliance (Werden, 1996). The most popular structural indicator is referred to as the Herfindahl-Hirschman Index (HHI), which equals the sum of squared market shares of all competing firms in a relevant market[4]. Thus, the basic steps of traditional merger analysis are: i) defining the relevant product and geographic market, ii) calculating pre-merger market shares and the corresponding HHI, iii) calculating predicted post-merger market shares along with the corresponding HHI, and

---

[3] Although structural merger analysis is regularly referred to as 'traditional' (Werden, 1997), this tradition did not become well established until long after the introduction of the Clayton Act. It was not until 1948 that this 'tradition' began to be established as the status quo by legal precedent. United States v. Columbia Steel (1948) was the first horizontal merger case to utilize market share information obtained after defining the "relevant market." Two additional cases that further established this practice were Brown Shoe Co. v. United States in 1962 and Unites States v. Philadelphia Nat'l Bank in (1963) (see Werden, 1997).

[4] For a detailed account of the relationship between the HHI and market conduct predictions see, e.g., Church and Ware (2000).

iv) determining whether or not the change in HHI will result in an unacceptable[5] exertion of market power or if the increase in concentration will be eliminated by new entry.

For example, suppose we have an industry of 4 equally sized firms where two of them wish to merge. The initial value of the HHI can easily be computed as

$$HHI = \sum_{i=1}^{N} s_i^2 = 0.25$$

or 2,500 after being scaled up.[6] Post-merger, the two integrated firms have a combined market share of 0.5 and the new HHI becomes

$$HHI = \sum_{i=1}^{N} s_i^2 = 0.375$$

or 3,750. The FTC or DOJ then must decide if the 1250-point increase in the HHI indicates an anti-competitive increase in market power, and ultimately whether or not to approve the merger.

The 1992 Horizontal Merger Guidelines (hereafter referred to simply as “the guidelines”) issued by the FTC and DOJ outline the use of market structure indicators to identify potentially harmful mergers. As noted above, the first task is to gage the level

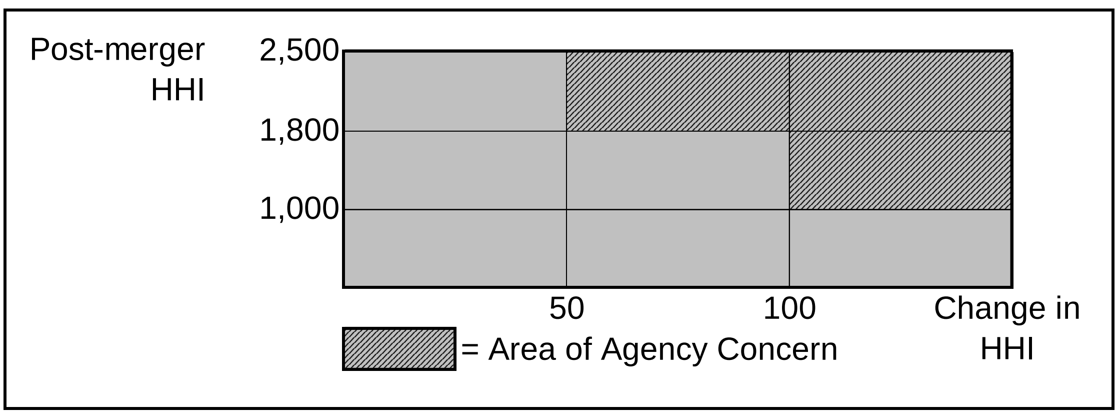
---

[5] According to the merger guidelines, an unacceptable merger is one that results in the ability of the merged entity to sustain a significant price increase that would otherwise be unattainable in an acceptably competitive business environment.

[6] The standard practice of the regulatory agencies is to multiply the HHI by 10,000. Thus, the HHI has a lower bound of 0 for the case of perfect competition, and an upper bound of 10,000 for the case of monopoly.

of concentration found in the market. The guidelines indicate that a market with a post-merger HHI (recall that the post-merger HHI is determined a priori) of less than 1,000 is competitive. Thus, proposed mergers in this market are unlikely to be investigated or challenged by the agencies. A proposed merger that results in a post-merger HHI between 1,000 and 1,800 will likely be challenged if the change in HHI from the pre-merger scenario is greater than 100. A post-merger HHI greater than 1,800 is indicative of a concentrated market. Within this environment a change in the index of more than 50 points will result in an FTC investigation. Figure 1 provides a summary of these guidelines.

FIGURE 1
AREAS OF POTENTIAL CHALLENGE AND RELATIVE “SAFETY” OF PROPOSED MERGERS



Although the guidelines appear to provide strict “action points” in terms of HHI threshold levels and threshold changes, the FTC and DOJ have been quite open about the fact that they do not strictly adhere to these rules of engagement (Tucker and Sayyed, 2006). This is no surprise as these agencies have recognized for some time now that market shares and market concentration are only one component that contributes to the anti-competitive potential of a merger (Werden, 1996; Werden, 1997; and Church and Ware, 2000). For example, as stated in section two of the guidelines, "market share and concentration data provide only a starting point for analyzing the competitive impact of the merger" (FTC, 1992). However, a quick glance at Table 1 indicates that market

TABLE 1 Data for Fiscal Years 1999-2003 on Individual Relevant Markets in Cases in Which the Agencies Challenged Mergers

	Change in the HHI								
Post-Merger HHI	0-99	100-199	200-299	300-499	500-799	800-1,199	1,200-2,499	2,500+	Total
7,000+	0	0	0	2	3	10	44	223	282
5,000-6,999	0	2	4	16	9	14	173	52	270
4,000-4,999	0	1	3	16	34	30	79	0	163
3,000-3,999	0	3	4	16	37	63	53	0	176
2,400-2,999	1	5	6	18	132	34	1	0	197
2,000-2,399	1	1	7	32	35	2	0	0	78
1,799-1,999	0	7	5	14	14	0	0	0	40
0-1,799	0	17	18	19	3	0	0	0	57
Total	2	36	47	133	267	153	350	275	1263

Source: Merger Challenges Data, Fiscal Year 1999-2003, Issued by the Federal Trade Commission and the Department of Justice. December 18, 2003

Note: HHI = Herfindahl-Hirschman Index of market concentration

definition and concentration still plays a major role in regulatory oversight. This table provides data on the number of proposed mergers that were challenged on the grounds of anticipated post-merger HHI estimates along with the corresponding change in the pre-merger HHI level. While this data provides no information on proposed mergers that "should have" (based on HHI considerations only) been challenged but weren't, it clearly shows that there were many more challenges in the "Area of Agency Concern" as defined in Figure 1.

Despite the "celebrity status" enjoyed by the Herfindahl-Hirschman index in traditional merger analysis, the practice has not proceeded without criticism. It is fascinating to note that despite its growth in popularity in the 50s and 60s, Edward Chamberlin, one of the preeminent economists of the time was quite critical of the practice. In 1950 he said,

> "Industry" or "commodity" boundaries are a snare and a delusion…in the highest degree arbitrarily drawn, and, wherever drawn, establishing at once wholly false implications both as to competition of substitutes within their limits, which supposedly stops at their borders, and as to the possibility of ruling on the presence or absence of oligopolistic forces by the simple device of counting the number of producers included (Chamberlin, 1950, pp. 86-87).

Chamberlin's comments highlight two very important weaknesses inherent in structural merger analysis. First is the well-recognized fact that, while theory is quite clear (ceteris paribus) in establishing the relationship between market shares and firm conduct, it provides no systematic guidelines for establishing the relevant product and geographic market from which the shares are derived. Sadly, the arbitrary nature of market definition has contributed to structural merger analysis that is motivated more by rent-seeking than by unbiased research. As stated by Church and Ware (2000, pp. 732-33), "two high-priced economists can always be found who support opposite contentions about the relevant market!" Additionally, Chamberlin recognized the intensification of this problem in differentiated product industries, where the boundaries of competition are often indistinguishable when large numbers of products appear to be continuously distributed across price and attribute space.[7]

Fortunately, the culminating criticism of structural merger analysis did not go unnoticed by the regulatory agencies. While still quite focused on structural merger analysis, the 1992 Horizontal Merger Guidelines provide a major breakthrough in the modern analysis of mergers. As discussed in Capps, Church, and Love (2003), the guidelines provide an important distinction between *coordinated effects* and *unilateral effects* of mergers. Coordinated effects are based on the collusion models of Edward Chamberlin (Chamberlin, 1962; Hay and Werden, 1993). The basic idea is that a merger, by reducing the number of competitors in a market, increases the potential for the remaining firms to coordinate their behavior (either tacitly or by overt collusion), thereby facilitating the use of collective market power. On the other hand, the notion of *unilateral effects* recognizes the ability of the merged entity to raise prices due to the internalization of pre-merger competitive constraints. These market power constraints refer to the ability of consumers to find suitable substitute products in the event of an increase in the price of their "first-choice" good (Baker and Bresnahan, 1985). For example, the ability of say PepsiCo to raise the price of its namesake product is constrained by the price of Coca-Cola. Although these products are not perfect substitutes, their characteristics are close enough that a significant price increase in one

---

[7] Although not considered in this analysis, it is interesting to note that structural merger analysis is not without flaws in homogeneous product industries. Contrary to the historical notion that increases in market concentration are welfare reducing, Farrell and Shapiro (1990) demonstrate the feasibility of scenarios in which increases in market concentration actually improve overall welfare, thus calling into question the usefulness of structural indicators in predicting market power exertion.

would likely be unprofitable due to demand- or supply-substitution[8]. If firms producing highly competitive yet differentiated products are allowed to merge, an avenue of competition will be eliminated, thereby empowering the merged entity to unilaterally exercise market power.

In addition to the growing concerns over structural merger analysis, several authors have mentioned numerous reasons for the emergence of horizontal merger simulation. Advances in Industrial Organization theory, access to retail scanner data, and the technological improvements that allows for relatively costless analysis of such data, have all culminated in the ability to simulate the price effects of a proposed merger (see Capps, Church, and Love, 2003; and Werden, 1997). As will be demonstrated below, this procedure circumvents the challenge of defining a relevant product and geographic market.

The Basics of Merger Simulation

In stark contrast to structural merger analysis, merger simulation does not simply try to establish indicators of potential market power exertion, but instead pursues the ambitious goal of predicting the price effects of a merger explicitly (Capps, Church, and Love, 2003). The essential steps in a merger simulation model are as follows[9]:

1) Referred to as the "front-end" of a merger simulation, a demand model must be

---

[8] The 1992 Merger Guidelines distinguish these two types of substitution as follows: "A price increase can be made unprofitable by consumers either switching to other products or switching to the same product produced [or distributed] by firms at other locations."

[9] For other descriptions of these steps see Church and Ware (2000), Werden (1997), Hausman, Leonard, and Zona (1994), and Capps, Church, and Love (2003).

assumed and then estimated using pre-merger price and quantity data to obtain own- and cross-price elasticities.

2) Next, using the "front-end" demand elasticities, profit maximization conditions for each firm are solved for marginal costs of merging and nonmerging firms. The equations for this procedure are based on the assumption of oligopoly price competition and the existence of a static Bertrand-Nash equilibrium.

3) Assuming that marginal costs remain fixed, we can then simulate post-merger prices by internalizing the product competition of two (or more) firms. We do this by combining the profit maximization calculus of their respective products.

For clarification, consider the following simple example. Assume the existence of two firms, both producing two differentiated products. We also assume that competition between the four products is over prices and that a static Nash-equilibrium exists. Momentarily ignoring step 1) above, consider the profit equation for the ith firm:

$$\Pi^i = \sum_{j=1}^{2} (p_j^i - c_j^i) q_j^i (P) \qquad i = 1, 2$$

where p_j^i is the retail price of firm *i*'s *j*th product, c_j^i are the corresponding marginal cost of production, q_j^i is the market demand for the *j*th product of the *i*th firm, and *P* is a vector containing all four retail prices. Assuming profit-maximizing behavior, we obtain the following first-order-conditions:

$$\frac{\partial \Pi^i}{\partial p_1^i} = q_1^i + (p_1^i - c_1^i)\frac{\partial q_1^i}{\partial p_1^i} + (p_2^i - c_2^i)\frac{\partial q_2^i}{\partial p_1^i} = 0 \qquad i = 1, 2$$

$$\frac{\partial \Pi^i}{\partial p_2^i} = q_2^i + (p_1^i - c_1^i)\frac{\partial q_1^i}{\partial p_2^i} + (p_2^i - c_2^i)\frac{\partial q_2^i}{\partial p_1^i} = 0 \qquad i = 1, 2$$

Using a few simple algebra steps, we can convert these conditions to be in terms of price-elasticities and expenditure shares:

$$\frac{\partial \Pi^i}{\partial p_1^i} = w_1^i + \left(\frac{p_1^i - c_1^i}{p_1^i}\right)\varepsilon_{11}^i w_1^i + \left(\frac{p_2^i - c_2^i}{p_2^i}\right)\varepsilon_{21}^i w_2^i = 0 \qquad i = 1, 2$$

$$\frac{\partial \Pi^i}{\partial p_2^i} = w_2^i + \left(\frac{p_1^i - c_1^i}{p_1^i}\right)\varepsilon_{12}^i w_1^i + \left(\frac{p_2^i - c_2^i}{p_2^i}\right)\varepsilon_{22}^i w_2^i = 0 \qquad i = 1, 2$$

where, given that X is total expenditure, the demand elasticities and expenditure shares are defined by,

$$\varepsilon_{jk}^i = \left(\frac{\partial q_j^i}{\partial p_k^i}\right)\frac{p_k^i}{q_j^i} \quad \text{and} \quad w_j^i = \frac{p_j^i q_j^i}{X}$$

respectively. Now, going back to step 1) we can use the estimated demand elasticities, along with pre-merger prices and expenditure shares to solve each firms two profit maximizing equations for the two unknown marginal costs. To simulate the price effects of a merger between the two firms, we simply combine their profit function as such:

$$\Pi^M = \sum_{j=1}^{4}(p_j - c_j)q_j(P),$$

where the merged entities profit is now a function of all four products. Again, taking first-derivatives with respect to prices, then converting to elasticity and share form, we obtain:

$$\frac{\partial \Pi^M}{\partial p_j} = w_j + \left(\frac{p_j - c_j}{p_j}\right)\varepsilon_{jj} w_j + \sum_{k \neq j}\left(\frac{p_k - c_k}{p_j}\right)\varepsilon_{kj} w_k = 0 \qquad \forall\ j$$

Assuming that elastities, product expenditure shares, and marginal costs remain fixed at their pre-merger levels, we can easily solve these four post-merger profit-maximizing equations for the four retail prices. From here, we can easily calculate the percentage change in prices from their pre-merger levels. Welfare measures such as compensating variation can be determined as well (e.g. see Nevo, 1997).

Since the establishment of these basic merger simulation procedures by Werden and Froeb (1994) and Hausman, Leonard, and Zona (1994), numerous studies have begun to explore the strengths and weaknesses of this new approach to merger analysis. However, the relative newness of merger simulation has created a substantial opportunity for addressing new or complicated issues that have not been sufficiently explored in the literature.

Introduction to Essay 1

Essay 1 will closely follow a theme that has dominated the first decade of merger simulation research. The focus of this early research has dealt primarily with demand specification (see e.g. Hausman, Leonard, and Zona, 1994; Werden and Froeb, 1994; Crooke et al., 1999; Saha and Simon, 2000; Nevo, 2000a; Hosken et al., 2002; Capps, Church, and Love, 2003; and Pinkse and Slade, 2004). This pattern of research makes perfect sense given that the essential inputs into any merger simulation are derived from an assumed demand model. Recently, merger simulation has been used as a convenient backdrop by which authors have introduced new and often complex demand models constructed to address a major challenge of differentiated product demand estimation (see e.g. Nevo, 2000a; Pinkse and Slade, 2004; and Dube, 2005). This problem is known as the curse of dimensionality (a.k.a. the degrees of freedom problem (see Gujarati, 1995)).

As will be demonstrated, the curse of dimensionality can be very difficult to address without placing major restrictions on substitution patterns. Modern specifications such as the random coefficients or “mixed” logit model (Berry, 1994; Berry, Levinsohn, and Pakes, 1995; McFadden and Train, 2000; and Nevo, 2000b), and the multiple-discreteness model (Hendel, 1999; and Dube, 2004) have been successfully used to model demand for highly differentiated product categories without imposing unrealistic patterns of substitution. Though successful in circumventing the “curse” without sacrificing flexibility, these models are yet to be used in real merger cases due in large part to the time-consuming and complex estimation necessary for their utilization (Hosken et al., forthcoming). On the other hand, an alternative approach has recently been introduced that, in terms of merger simulation usefulness, possesses all of the benefits of the these former models yet is much simpler in terms of estimation complexity (van Damme and Pinkse, 2005). This approach is known as the Distance-Metric (DM) Demand Model (Pinkse and Slade, 2004).

The objective of Essay 2 is to assess the practical merits of the DM demand model. Although the basic strengths of this approach have been established, the robustness of these strengths are yet to be solidified in more complicated situations. For example, like the logit-family of models, the DM approach relies on product characteristics to reduce parameter dimensionality. However, due to data limitation, Pinkse and Slade's (2004) demand application involving 63 brand-level beer products employed a very small number of product attributes (two; alcohol content and geographic coverage). Perhaps beer substitution patterns can be accurately depicted with little more than alcohol content information, but what of product categories where the number of observable attributes is large? If the DM approach is ever to prove useful to those who are intimately involved with horizontal merger cases, any questions as to its ease of use, flexibility, and robustness must be well established in the literature.

To explore the above questions, the DM approach will be applied to estimate demand for 45 bottled juice products. Twenty-two specifications involving various combinations and functional form assumptions regarding product characteristics will be estimated to investigate the robustness of not only the demand elasticity results, but a host of hypothetical post-merger price simulations as well. It will be shown that in cases where there exist a large number of attributes to choose from, and when there is no a priori information (i.e. intuition or expert opinion) or statistical means (i.e. loss criterion) available to assist in the selection of relevant product attributes, that regardless of the choice made the DM demand model is quite robust in its estimation of substitution patterns and post-merger price effects.

Introduction to Essay 2

"Leaving the trail" so to speak and venturing into an area that is yet to be addressed in merger simulation literature, Essay 2 establishes the important role played by retailers in affecting the outcome of an upstream horizontal merger. When mergers take place between manufacturers, the conventional assumption used in merger simulation is that of *channel coordination*. This assumption treats retailers as neutral pass-through intermediaries who play no role in affecting the price effects of an upstream merger. In essence, the model is set up as if manufacturers sell their products directly to consumers. In addition, it assumed that final pricing of goods is uniform across all consumer groups. In other words, retailers do not price discriminate.

The reality of the situation is much different. Well documented in marketing literature is the fact that retailers are quite sophisticated in their pricing decisions. They do not behave as neutral pass-through agents but instead take numerous factors into consideration when setting category prices. A major part of this decision is the market in which their store is located. With the availability of scanner data, as well as numerous means of collecting information about customer profiles, retailers have come to recognize the relationship between demographics and willingness to pay. Therefore, over the years, retail chains have become more fine-tuned in determining store level prices. Instead of attaching uniform markups across all stores, retail chains may establish broad or narrowly defined regions in which they tailor the prices of each store within the region to the average demographic profile of the regional consumer base. This form of third-degree price discrimination has become known in the marketing literature as *zone-pricing*.

In an environment of such pricing behavior the task of assessing the consumer welfare implications of an upstream merger becomes much more complex. It is easy to see that the retailer's pricing decision may create a range of post-merger price effects that are distributed across numerous cohorts of the population. The objective of Essay 2 is to explore this variation.

Using store level scanner data for a single retailer, merger simulations are conducted for 10 aggregate products in the ready-to-eat cereal (RTEC) category. The analysis is first conducted at the chain level. For comparative purposes, the chain is then divided in to two price zones, where the zones are determined by zip-code level demographic data. The same merger simulations are then carried out for each price zone to demonstrate the level of variation of price effects across the two zones.

Although it is beyond the scope of this paper to gage whether or not the FTC and DOJ would be concerned by such variation in merger effects, the possibility of any concern on their part validates the contribution of this research. The possibility that merger authorities could investigate or prevent a merger on the basis of a subgroup of the population has implications for both the upstream manufacturers as well as the downstream retailers. This possibility establishes retail price discrimination as a potential threat to upstream firms who wish to join forces. As such, zone-pricing could find an importance place in the strategic interactions between manufacturers and retailers. In addition, the high-costs associated with "fighting" for merger approval can be mitigated if manufacturers can assess with some degree of accuracy the probability that a merger proposal will be approved, a priori. Thus, the possibility that zone-pricing could play a role in establishing the region of "safe" merger opportunities is something that manufacturers would want to be aware of.

Introduction to Essay 3

The goal of accurately modeling the implications of an upstream horizontal merger along the vertical supply-channel is a lofty one indeed. The process involves numerous assumptions about the interaction of market players, any of which, if wrong, could grossly misrepresent the realities of an actual merger. Consider the following example list of questions, upon which numerous model assumptions are based:

(i) How should retail demand be modeled?

(ii) Do retailers set uniform prices or engage in price discrimination?

(iii) How should the supply-channel be modeled, i.e. Channel Coordination (CC) vs. Manufacturer Stackelberg[10] (MS) vs. Retailer Stackelberg (RS)?

(iv) Over what variables do the channel players compete, i.e. prices (Bertrand)[11] vs. quantities (Cournot)?

Since the starting point of all merger simulations is the researchers choice of a

[10] Manufactuer Stackelberg (MS) is defined as in Choi (1991). In this scenario manufacturers lead the strategic interaction by setting wholesale prices. The retailers then follow by setting retail prices.

[11] Due to the nature of differentiated product categories, the assumption of Bertrand competition (or competition over prices) is standard in merger simulation literature.

demand model, it is no surprise that the vast majority of pertinent literature has focused on the implications regarding this choice (see e.g. Werden and Froeb, 1994; Crooke et al., 1999; Saha and Simon, 2000; Nevo, 2000a; Hosken et al., 2002; Capps, Church, and Love, 2003; and Pinkse and Slade, 2004). Question (ii) above has begun to receive some attention in a piece by Pofahl, Capps, and Love (2006), where the relative ease of integrating non-uniform retail pricing behavior into a merger simulation model is demonstrated. O'Brien and Shaffer (forthcoming) and Milliou and Petrakis (2005) address (iv) by questioning, all together, the use of constructs such as Bertrand or Cournot competition to accurately represent the interactions of manufacturers and retailers. Instead they appeal to the use of contract theory to explore alternative forms of interaction between the channel players.

Somewhat of a surprise is the lack of attention regarding question (iii). It's not that the issue has been completely overlooked. Leaving the standard assumption of Bertrand competition in tact, it has been acknowledged that the way in which this competition plays out within the supply-channel could have major implications for merger simulation results (Hosken et al., 2002; Froeb, Hosken, and Pappalardo, 2004; Villas-Boas, 2004). For example, the standard assumption in virtually all papers involving merger simulation is that manufacturers sell their differentiated products directly to final consumers. In some product categories this assumption may not be problematic. However, a large subset of merger simulation research involves products that are first sold to a channel intermediary, such as a supermarket, before being sold to final consumers. For example, merger simulations have been conducted in product categories such as beer (Hausman, Leonard, and Zona, 1994), bread (Saha and Simon, 2000), ready-to-eat cereal (Nevo, 2000a), spaghetti sauce (Capps, Church, and Love, 2003), and carbonated soft drinks (Dube, 2005). Despite the possibility that retailers and manufacturers do not behave as a vertically integrated structure, these studies, nevertheless, assume that the channel is, in fact, coordinated.

Although, as mentioned, it is well recognized that leaving the relative simplicity of coordinated channels could not only be more consistent with reality, but also have significant impacts on results, this issue is yet to be addressed in published literature. The objective of this paper is to investigate the effects of an alternative assumption about channel interactions on the simulation of post-merger price changes. It will be assumed the vertical strategic interaction (VSI) is characterized by a two-stage game in which manufacturers play the role of first-movers in setting wholesale prices, and retailers act as followers in setting retail prices (i.e. Manufacturer-Stackelberg).

It should be noted that the goal of this research changed somewhat as it progressed. The initial idea was to present a simple comparison of post-merger price changes from a model that assumed channel coordination with one that assumed a vertical structure characterized by Manufacturer-Stackelberg game-play. However, as the research progressed it became apparent that making the transition from a model of channel coordination to one involving a two-stage game was not an easy one. Given that the first set of results from the Manufacturer-Stackelberg model were unrealistically high, it became important to investigate the individual components of the model to determine what elements had the most influence on results. Much of this investigation centers on the estimation of retail pass-through rates (i.e. the change in retail price or product *i* with respect to a change in the wholesale price of product *j*). As it turns out, the need to understand how various demand specification assumptions effects merger simulations, while clearly important in the literature thus far, is intensified by the complexity of a two-stage channel game. The "modified" goal, then, is to draw attention to potential "trouble" issues that may arise, and need further research, in conducting merger simulations involving two-stage games.

The motivation and justification for this research stems from the institutional reality of the package foods industry. In an industry characterized by competing manufacturers selling to downstream retailers, it would come as no surprise to find out that interactions between these players are not coordinated, i.e. that perhaps one end of the channel (or one player in one end) had the ability to act as a leader in setting prices, while all others were forced to follow. There is much evidence in the marketing literature that this possibility is quite real. For example, evidence of Manufacturer-Stackelberg pricing has been found in several supermarket categories, such as, yogurt and peanut butter (Sudhir, 2001), ketchup (Besanko, Dube, and Gupta, 2003; and Villas-Boas and Zhao, 2005), pasta (Cotterill and Putsis, 2001), and instant coffee (Cotterill and Putsis, 2001).

An abundance of studies exist in the marketing literature in which modeling of the strategic interactions between upstream manufacturers and downstream retailers are a key component. However, most of these studies are attempting to infer what type of market behavior is consistent with the observable data they possess. For example, Kadiyali, Chintagunta, and Vilcassim (2000) use an assumed demand model along with parameterized supply-side equations which are then estimated simultaneously to obtain optimal pricing rules and to infer which, if any, market players possess pricing power. Cotterill and Putsis (2001) conduct a similar study but use what could be regarded as a "menu" approach to determining which assumptions regarding demand form, supply structure, and pricing rules best fit the data. More explicitly, given three demand specification alternatives, two forms of vertical interaction (Manufacturer Stackelberg and Vertical Nash[12]), and two types of retail markup behavior (proportional markups or nonproportional markups), Cotterill and Putsis (2001) analyze all combinations of these components and determine which formulation best fits the data. In 2001, Sudhir "ups the ante" by adding inference of interactions between manufacturers to the mix. Analyzing the yogurt and peanut butter categories, he simultaneously determines that the best fitting model for these categories is characterized by 1) category profit maximizing pricing by retailers (as opposed to brand profit maximizing pricing), 2) Manufacturer Stackelberg game-play between manufacturers and retailer, and 3) tacitly collusive pricing interactions between the upstream manufacturers. Finally, Villas-Boas and Zhao (2005) conduct a study that is almost identical to Sudhir's, but apply their model to the Ketchup market of Midland, Texas.

The common theme in the papers above is the inference of competitive or anti-competitive behavior along the vertical channel. While the goal of this paper is not to

---

[12] As opposed to the MS model where manufacturers are leaders in setting prices and retailers are followers, the VN model assumes that neither end of the supply channel has the ability to be a price leader. Thus, manufacturers and retailers make their pricing decisions simultaneously.

identify the channel structure, the “channel-identification” literature is important to this study in that it provides an excellent outline of how to model various channel structures, an obviously important component of this paper.

A vein of literature more closely related to the objectives of this paper includes those that assume a channel structure and then use this assumption to address “other “ issues. For example, Besanko, Gupta, and Jain (1998) assume Vertical Nash interactions between manufacturers and retailers and use the corresponding price response functions to account for price endogeneity in their demand estimation. In other words, their paper is not concerned with the identification of channel structure: it is concerned with measuring the demand estimation bias that can occur when price endogeneity is not accounted for. Similarly, Besanko, Dube, and Gupta (2003) use the Manufacturer Stackelberg construct to explore various opportunities for price discriminating behavior among channel players. Again, while the selection of a vertical game in these papers was not ad hoc (they used intuition to guide their choice), the focus of these papers was not to infer the true nature of the supply channel.

In similar fashion, to restate, the goal of this paper is not to identify the nature of interactions between manufacturers and a retailer, but to simply explore how two assumptions regarding this interaction (channel coordination vs. Manufacturer Stackelberg) can affect the impending results. The remainder of the paper will proceed with an outline of modeling details, data and results, followed by a discussion of the conclusions.

Outline of Dissertation

The dissertation is organized as follows. The introduction provides a general overview of the motivation and justification for this dissertation, as well as an introduction to each of the three essay topics to be addressed. Essay 1 consists of the paper "Distance Metric Demand Modeling and Simulated Mergers in the Bottled Juice Category." Essay 2 presents the article, "Retail Zone-Pricing and Simulated Price Effects of Upstream Mergers," and Essay 3 contains a final piece entitled, "Supply Channel Stage-Games and Horizontal Merger Simulation." Essays 1, 2, and 3 are all similarly organized in that they contain introductions, background/review-material, theoretical models, empirical setting information, estimation details, results, and conclusions. A recap of the major conclusions of all three papers can be found in a Conclusion that follows the Essay 3..

DISTANCE METRIC DEMAND MODELING AND SIMULATED MERGERS IN THE BOTTLED JUICE CATEGORY

Introduction

Horizontal merger simulation can easily be viewed as a production process. The output being produced is a prediction about post-merger price changes. The inputs used to produce these predictions are observed prices, quantities (or shares), assumptions about demand, and assumptions about optimization behavior. As with any production process, the quality of the output is only as good as the quality of the inputs being used. Although several inputs are listed above, the inherent challenges and relative subjective nature involved in the selection of one of these inputs has caused it to receive the lion's share of attention in merger simulation research. The input I'm referring to is the choice regarding demand specification.

One of the major reasons for the introduction of merger simulation was the extreme difficultly experienced by consultants, regulatory agents, and the courts to arrive at a consensus regarding relevant product and geographic market definitions (see e.g. Berry and Pakes, 1993; Werden, 1997). This difficulty called into question the reliability of using such subjectively obtained definitions to derive indicators of market structure that would then be used as predictions of post-merger market power exertion. The problem was and is particularly notable in industries characterized by large numbers of competitive yet differentiated products (Bresnahan, 1989). Ironically, although it could be argued that the goals of merger simulation (explicit post-merger price predictions) are loftier than those of traditional merger analysis (broad indicators of market power exertion), the problem posed by highly differentiated product industries has not been alleviated by the advent of merger simulation. If no tools exist for the *suitable* demand modeling of a highly differentiated product market, then of what value are the predictions of a model that is missing a large piece of the competitive pie?

This concern is not new and has been the motivation for much research in industrial organization and legal studies (see e.g. Baker and Bresnahan, 1985). Nevertheless, only recently have efforts been made to conduct merger simulations within product categories that possess "envelope pushing" levels of product differentiation. This "fledgling" vein of literature has used merger simulation as a convenient backdrop by which new methods for modeling differentiated products demand have been introduced; for example, merger simulations have recently been conducted using the following demand models: i) mixed logit (Nevo, 2000a), ii) multiple-discreteness (Dube, 2005), and, the focus of this essay, the Distance Metric (DM) demand model of Joris Pinkse and Margaret Slade (2004).

The objective of essay 1 is to explore the practical merits of the DM demand model using an application involving the US bottled juice category. Although the basic strengths of this approach have been established, the robustness of these strengths are yet to be solidified in more complicated situations. For example, like the logit-family of models, the DM approach relies on product characteristics to reduce parameter dimensionality. However, due to data limitation, Pinkse and Slade's demand application, involving 63 brand-level beer products, employed a very small number of product attributes[13]. Perhaps beer substitution patterns can be accurately depicted with little more than alcohol content information. But what of product categories where the number of observable attributes is large? If the DM approach is ever to prove useful to those who are intimately involved with horizontal merger cases, any questions as to its ease of use, flexibility, and robustness must be well established in the literature.

To explore the above questions, a modified DM demand model will be applied to estimate demand for 45 bottled juice and juice drink products. Twenty-two specifications involving various combinations and functional form assumptions regarding product characteristics will be estimated to investigate the robustness of not only the demand elasticity results, but a host of simulated post-merger price effects as well. It will be shown that in cases where there exist a large number of attributes to choose from, and when there is no a priori information (i.e. intuition or expert opinion) available to assist in the selection of relevant product attributes, that regardless of the choice made, the DM demand model is quite robust in its estimation of substitution patterns and post-merger price effects.

The remainder of this essay will proceed as follows. We start with a presentation of background material, first regarding the relevance of the bottled juice category in merger simulation analysis, then regarding the challenges of estimating demand for

[13] Pinkse and Slade (2004) use the following attributes to define distance metrics: alcohol content, brand, manufacturer, and coverage (where coverage is defined as the % of outlets in a geographic area that stock each product in a given time period).

differentiated products and the available solutions that can address these challenges. Next, we lay out the details of constructing a DM demand model. The merger simulation model is then discussed. A detailed accounting of the data, model setup, and estimation is provided, followed by a discussion of results and conclusion.

Background

The Bottled Juice Category

The bottled juice category was selected for numerous reasons. The primary motivation was that it is a prime example of a highly differentiated product category and serves as an appealing subject for implementing the DM approach to demand. In addition, trends in the nonalcoholic beverage industry lead many to believe that the shelf-stable juice category is primed for merger activity (see e.g. Aoki, 2004). To understand the logic behind this belief, one must look beyond the immediate category.

The story behind this belief begins in the carbonated soft drink (CSD) industry. Dominated by three companies, Coca-Cola Co, PepsiCo, and Cadbury-Schweppes, the CSD industry employs over 175,000 people, generating $8 billion per year in wages and salaries[14]. By some estimates, the CSD category is the largest category in the U.S. Dry goods Department, accounting for roughly one tenth of all sales (Dube, 2005).

During the “cola wars” of the 1980s, competition reached a level in which

---

[14] Economic Impact of the Soft Drink Industry, The national soft drink association, www.nsda.org (accessed August, 2006).

massive advertising budgets were allocated to the emergence and success of new products. Even still, the probability of new product success was quite low, making industry consolidation a much more appealing alternative (Dube, 2005). However, only one of the “big three” CSD companies had much success with brand takeovers. By 1995, Cadbury Schweppes had acquired Canada Dry, Hires Root beer, Crush, 7-UP, Dr. Pepper, A&W Root beer and Squirt. On the other hand, Coke and Pepsi were stifled in their CSD merger endeavors. In the late 80s Coke (the number one firm) announced plans to merge with Dr. Pepper (the number three firm) and Pepsi (the number two firm) announced plans to acquire 7-UP (the number four firm). Pepsi abandoned its plans after the FTC announced an investigation of both mergers. Coke persisted but ultimately failed when the FTC decided that the merger would give the company too much market share (Dube, 2005).

Given the relative “end-of-the-road” status regarding merger opportunities in the CSD category, the “soda-giants” decided to look elsewhere. Cadbury Schweppes purchased Mott’s (seller of apple and Clamato juice) in 1982 along with Hawaiian Punch in 1999. Pepsi made its biggest acquisition to date when it acquired Tropicana in 1998. Two years later Pepsi became the largest share holder in the popular new-age juice drink Sobe and in 2001 purchased Quaker for $14 billion dollars in a bid, no doubt, to acquire the oat companies $2 billion a year Gatorade brand (Herper and Schiffman, 2001).

Recent events suggest that the movement of CSD companies into categories such as shelf-stable juices is only going to become more pronounced. As one of the latest scape-goats of America’s obesity epidemic, CSD companies continue to be targets of policy makers and activists, whose aim is to curb the consumption of their “fat-causing” soft drinks. In May, 2006 pressure from anti-obesity groups culminated in a deal with Coca-Cola, PepsiCo, and Cadbury Schweppes that will end the sales of sugary sodas in most public schools within four years (Sagon, 2006). The angst against growth of CSD consumption has surely made the relative healthy appearance of juice products an attractive area for CSD companies to grow.

Another source of consolidation incentives comes from the bottled juice companies’ “side of the aisle.” Recognizing the strong movement of CSD companies into the bottle juice category has certainly caught the attention of traditional category leaders. In particular, Ocean Spray, the best-selling brand name in the bottled juice arena, has recognized the challenge of trying to compete with the resources of behemoths like Coca-Cola Co. and PepsiCo. In June 2004, Ocean Spray’s 650 cooperative owners narrowly voted (52%) to reject an acquisition proposition from PepsiCo (Aoki, 2004). However, perhaps in light of growing competitive pressures, on July 13, 2006 Ocean Spray and PepsiCo announced a long-term strategic alliance in which PepsiCo would take over the marketing and distribution of Ocean Spray’s single-serve products (The Providence Journal, 2004).

A final source of merger incentives stems from the growth of private label bottled juice products, which could make it difficult for smaller juice companies to compete unless alliances are forged with other companies[15]. Declining[16] CSD sales (down 0.9 percent in the 52-week period ending May 21,2006 (Sagon, 2006)) as well as America's infatuation with healthy drinks means that merger activity could soon be on the rise in the bottled juice industry.

Demand for Differentiated Products

When performing merger simulation, it would be most ideal to know with certainty the "true" model of demand. However, since in practice this realization is never possible, some recognition of desirable features is helpful in arriving at a final approximation to the truth. For the purpose of merger analysis in differentiated product industries, Pinkse and Slade (2004) highlight three important features that should be considered when selecting a demand model (see Hosken et al. (2002) as well). Following is a list of these properties as well as a brief explanation as to their importance.

i) the model should have the ability to handle a large number of products (see introductory arguments)

ii) the model should be flexible in its ability to determine patterns of substitution. If a demand model predetermines the pattern of substitution

[15] According to IRI, retailers (excluding Walmart) recorded nearly $600 million (17% of category sales) in bottled juice sales for the 2005 fiscal year, which amounts to a 2.2% increase from the previous year (Private Label Buyer, 2005)).

[16] A survey by a beverage industry analyst at Morgan Stanley shows that 13-17 year olds are drinking fewer CSDs per capita than their predecessors. Instead, teenagers are increasing their consumption of sports and energy drinks (Sagon, 2006).

with little regard for what may actually be happening in reality, how then can the outputs of this model be effective in predicting the actual consequences of a merger?

iii) the model should be parsimonious, transparent, and easy to estimate. For consultants and regulatory authorities who actually work on merger cases, time is not an abundant commodity. Therefore, the models that usually get used in practice are the ones that can actually be constructed and estimated in a timely manner.

Amongst the large number of demand modeling choices, there is no clear winner that surpasses all others in exemplifying the three properties above. Thus, tradeoffs between these properties must be considered and decided upon given the data and market under consideration (Pinkse and Slade, 2004).

The challenge of incorporating a large number of products into demand system modeling is known as the curse of dimensionality. The curse of dimensionality, also known as the degrees of freedom problem, refers to the data and technological constraints that create an upper bound on the feasible estimation of model parameters (see Gujarati, 1995). Open any basic microeconomics textbook and it's easy to see why this problem is so pertinent to demand analysis. The tradition[17] taught in these books is that demand, as derived from constrained utility maximization, is a function of prices and income. If a demand equation is to contain the prices of all relevant goods in the

[17] I refer to traditional demand theory in the same sense that Lancaster did (see Lancaster, 1966).

market, estimation may not be a problem if only a handful of products are deemed relevant, but try doing it with 50 products and the data will likely be overwhelmed. More explicitly, a "simple" log-linear demand system involving 50 goods, with no restrictions imposed, would require the estimation of at least 2500 parameters! Fortunately, the use of theoretical restrictions such as homogeneity, symmetry, and adding-up can greatly reduce the number of unique parameters (Deaton and Muellbauer, 1980b). However, given a large number of products, this reduction still may not be enough (Nevo, 2000b).

Arguably the simplest solution to the dimensionality problem, and one that is used quite regularly in merger simulation literature (see Werden and Froeb, 1994; Werden, 1996; Crooke et al., 1999; and Saha and Simon, 2000) is the standard multinomial logit model of McFadden (1973). Couched in a discrete choice framework, the logit demand model reduces the number of model parameters by directly projecting demand onto characteristic space. Using this approach, the number of parameters to be estimated is determined by the dimensions of attribute[18] space as opposed to the number of products squared. To illustrate, even if a product category contained 50 competing goods, it may be that only 10 common attribute variables factor into the consumer's product choice. As a simple example, following is the standard multinomial logit share equation, which (as typically constructed) only contains a handful of parameters to be estimated (Train, 2003):

---

[18] The terms "characteristics" and "attributes" will be used synonymously.

$$S_i = \frac{\exp(\alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i})}{\sum_j \exp(\alpha + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j})}$$

where S_i is the share of the ith product, and the *x*'s are product characteristics, one of which might be own-price. As can be seen, with a logit demand model it is the dimensions of product characteristics that determines the number of parameters that need to be estimated, not the number of products.

Unfortunately, the logit model is not without weakness. What it gains in dimensionality reduction it loses in flexibility (Train, 2003; Pinkse and Slade, 2004; Nevo, 2000b; and Hausman and Leonard, 2005). The logit model possesses a property known as Independence of Irrelevant Alternatives (IIA). In terms of substitution patterns, the consequence of the IIA property is that cross-price elasticities are totally driven by market shares. A brief example will demonstrate why this is a problem. Suppose a logit model is used to estimate the demand for automobiles. Also assume that market shares for three of the cars are as follows: red BMW, 5%; blue BMW, 10%; Ford Pinto, 10%. Given a marginal price increase in blue BMW's, the cross-price elasticities derived from the logit model will predict substitution patterns proportional to the product market shares. Thus, of the consumers who choose to substitute away from blue BMWs, it is twice as likely that they will choose to purchase a Ford Pinto instead of a red BMW (see Train, 2003, for the famous "red-bus, blue-bus" example of IIA). Obviously, this strange pattern of substitution could be quite difficult to find in real world decision-making. Despite these weaknesses, the logit demand model has been used numerous times in merger simulation research (see Werden and Froeb, 1994; Werden, 1997; and Crooke et al., 1999).

A more general, and flexible version of the logit demand model is the nested logit model, which is of the Generalized Extreme Value (GEV) class developed by McFadden (see Train, 2003 for a description). This model begins with the partitioning of products into categories or *nests* containing similar products. In this way, substitution patterns are stronger within groups than across groups. However, IIA still holds within groups. While this model is much less rigid than the logit, flexibility of substitution patterns is still not regarded as one of its strengths (Pinkse and Slade, 2004). In addition, Bresnahan, Stern, and Trajtenberg (1997) have shown that the order of the nests can have a major impact on substitution patterns. To address this issue, they construct what they refer to as the principles-of-differentiation generalized extreme value (PD GEV) demand model. This model can handle several dimensions of *unordered* differentiation, yet still maintains the other disadvantages of the nested logit model (i.e. arbitrary groupings, and IIA within groups). While the PD GEV model has yet to appear in merger simulation studies, the nested logit has been used at least once to conduct merger simulations (see Ivaldi and Verboven, 2005).

Deemed possible by advances in estimation procedures, great strides have recently been made in bringing much greater flexibility to logit models (Train, 2003). The random coefficients or “mixed” logit model retains all the benefits of the standard logit yet is highly flexible as well (Berry, 1994; Berry, Levinsohn, and Pakes, 1995; McFadden and Train, 2000; and Nevo, 2000b). Flexibility in substitution is obtained by allowing model parameters to be random functions of household, or consumer characteristics. With the mixed logit model, cross-price elasticities are no longer determined by shares but by product characteristics and variation in the sensitivity to those characteristics (see Nevo, 2000b for a good "introductory" treatment).

Another highly advertised strength of the mixed-logit model is its ability to account for consumer heterogeneity. However, while knowledge of parameter distributions over continuously defined household characteristics is extremely valuable to marketers (see e.g. Allenby and Rossi, 1999; Petrin, 2002), its value is yet to be demonstrated in merger simulation. In fact, in Nevo's merger simulation paper (2000a), although he does obtain a continuous distribution of price elasticities, he conducts his simulations using only median valued substitution parameters (Dube (2005) does this as well in his merger simulation piece).

The downside of using mixed logit models has to do with their complexity. Estimation is performed using either Simulated Maximum Likelihood or Simulated Method of Moments, neither procedure being easy to implement let alone replicate (Hosken et al., 2002; Pinkse and Slade, 2004; van Damme and Pinkse, 2005). Given the difficulty of this model, only once has it been used in the front-end of merger simulation (Nevo, 2000).

So far, all of the above models come from a class known as Discrete Choice Models. A weakness of all of these models is that consumers are assumed to purchase one unit of one good, or nothing at all. In some categories, e.g. automobiles, this assumption is not problematic. However, in many categories, to assume single unit purchases may be a far stretch from the truth (Villas-Boas, 2004; and Dube, 2004). Without leaving the discrete choice paradigm completely, Hendel (1999) developed the Multiple-Discrete Choice demand model, which was later introduced to merger simulation literature by Dube (2005). This model possesses all the benefits of the mixed logit model but allows for multiple discrete units of multiple goods to be purchased in a single purchase occasion. However, like the mixed logit model, it is very complicated and difficult to estimate.

Another approach to differentiated product demand analysis fits within a class of models known as Representative Consumer Demand Models (see Anderson, de Palma, and Thisse, 1992 for an excellent explanation of different classes of demand models). Unlike, discrete choice models, this class of models allows for a continuum of choices. Popular representative consumer demand models that are characterized by “flexible functional forms” (see e.g. Diewart, 1971; and Deaton and Muellbauer, 1980b) are the Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980a), and the Rotterdam demand model of Theil (1980). These models are flexible in the sense that they leave the own- and cross-price elasticities free to be estimated by the data (Hausman, 1994). However, these models “play second fiddle” to discrete choice models when it comes to their ability to handle a large number of products (Nevo, 2000b; and Pinkse and Slade, 2004). This is because each demand equation contains a parameter for the price of every other product in the model. To alleviate some of the estimation burden, many researchers will impose the restrictions of symmetry, homogeneity, and adding-up. Even still, this reduction may not be enough when many products are in the mix (Nevo, 1997). Likely due to the strengths and weaknesses mentioned above, the AIDS and Rotterdam models have been used in several merger simulation papers involving only small numbers of products (see e.g. Crooke et al., 1999; and Capps, Church, and Love, 2003).

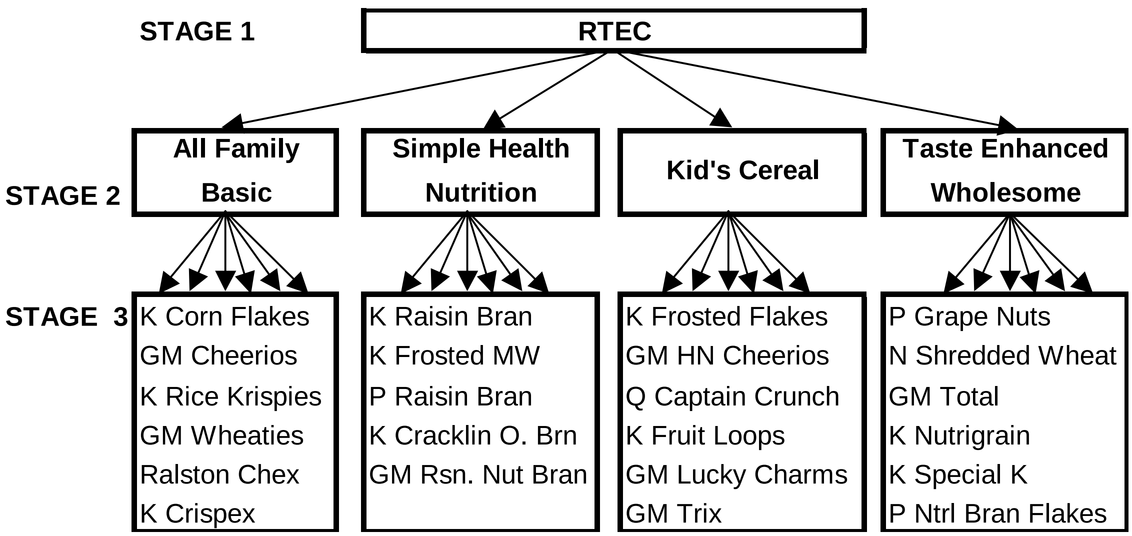
A desire to maintain the flexibility of models such as the AIDS and the Rotterdam, but still be able to handle a large number of products, has lead some authors to use a procedure known as multi-stage budgeting (Hausman, Leonard, and Zona, 1994; and Hausman, 1994). Introduced by Gorman[19] (see Deaton and Muellbauer, 1980b, and Hausman, 1994), and similar in logic to the nested logit model, multi-stage budgeting assumes that consumer expenditures are allocated in stages and that final-stage expenditures are within *groups* or *nests* of similar products. Figure 2 demonstrates how this concept could be applied in a category such as ready-to-east cereal (RTEC). First, the consumer decides how much of her budget to allocate to RTEC purchases. In the second stage she decides how much of that budget to allocate to each of the four subcategories.[20] For example, if she decided to spend half of her RTEC budget on kid's cereal and the other half on All Family Basic then her final stage decision would be how much to spend on the individual brands within these categories. In order to justify the final stage of this process, a condition known as weak separability must hold. Weak

[19] Although his original documents are difficult to come by, Gorman is given credit for the development of multi-stage budgeting. Deaton and Muellbauer use Gorman's lecture notes as the source of their books discussion on the topic (1980b). Hausman (1994) also sites an unpublished piece by Gorman in discussing the origins of multi-stage budgeting.

[20] Note that the consumer does not have to purchase from every subcategory.

separability implies that the demand equations for each good in a category can be specified as a function of its own price and the prices of other products in the same category. Thus, the dimensions of each final-stage system are reduced to the number of

FIGURE 2
MULTI-STAGE BUDGETING IN THE READY-TO-EAT CEREAL CATEGORY



goods within the category. For Figure 2, this means that instead of attempting to estimate a demand system of 23 equations each containing 23 price variables (which implies the estimation of at least 529 parameters) we could instead estimate a demand system for each category, the largest of which being only a six-equation system (for more details on weak separability and multi-stage budgeting see Deaton & Muellbauer (1980b)). In 1994 Hausman, Leonard, and Zona apply this procedure to conduct merger simulations involving 15 beer products.

In the literature, there are two major criticisms with regard to the use of multi-stage budgeting to estimate demand for highly differentiated products. One is that there are no set criteria dictating how a researcher should establish separate product groupings. Nevo (1997, 2000b) points out that while there are separability tests available to help form these groupings, the power of these tests is not sufficient to adequately reject "incorrect" groupings (for an example of separability testing see Capps et al., (1994)). Thus, there is a very real chance that different researchers will end up with different product groups, which could have a significant impact on the results. For example, stages 2 and 3 in Figure 1 were established by Ma (1997), but these differ from Hausman's (1994) RTEC categorization, which include only three categories, Adult, Kid, and Family. A final critique made by some authors is that multi-stage budgeting was not intended for highly differentiated product categories, but instead was meant to be used for broadly defined aggregate demand systems (i.e. where product categories were things like food, shelter, and clothing). Thus, these authors claim that multi-stage budgeting is only capable of handling a handful of products in each category (Nevo, 2000b; and Pinkse and Slade, 2004).

For a summary of the demand models used in merger simulations, as well as their relative strengths and weaknesses see Table 2 below.

TABLE 2 Demand Models Used in Merger Simulation Analysis and Their Relative Strengths Regarding Dimensionality Reduction, Flexibility, and Ease of Use

Author(s)	Method(s)	i)	ii)	iii)	Product/#
Hausman, Leonard, & Zona (1994)	Multi-stage budgeting	★★	★★	★★	Beer (15)
Werden & Froeb (1994)	Logit	★★★	★	★★★	Long-distance Phone Service (4)
Crooke, Froeb, Tschantz, & Werden (1999)	Logit	★★★	★	★★★	Monte Carlo Simulation with 8 products
	AIDS	★	★★★	★★★	
	Linear	★	★	★★★	
	Log-Linear	★	★	★★★	
Saha & Simon (2000)	Polynomial Logit	★★★	★	★★★	White Pan Bread (8)
Nevo (2000a)	Mixed Logit	★★★	★★★	★	Ready-to-eat Cereal (24)
Capps, Church, & Love (2003)	Rotterdam, AIDS	★	★★★	★★★	Spaghetti Sauce (6)
Pinkse & Slade (2004)	Distance Metric	★★★★	★★ or ★★★	★★★	Beer (63)
Dube (2005)	Multiple-Discreteness	★★★	★★★	★	Carbonated Softdrinks (26)
Ivaldi & Verboven (2005)	Nested Logit	★★★	★★	★★★	Heavy Trucks (?)

i) ability to handle a large number of products
ii) flexible in its ability to determine patterns of substitution
iii) parsimonious, transparent, and easy to estimate.

★★★★ = great
★★★ = good
★★ = ok
★ = not so good

Note: the ratings regarding i), ii), and iii) are subjective and are not meant to be exact. They are only meant to portray the arguments made for or against the particular demand models in the literature that has been reviewed.

Distance Metric Demand Modeling

Justification and Description

Arguably the most appealing models mentioned thus far in terms of their ability to model demand for many products while maintaining flexibility in substation are the mixed logit and multiple-discreteness models. However, until their practical applicability becomes more “user friendly” there exists a strong incentive to explore additional alternatives. To the best of my knowledge, the only potential “contender” that has arisen thus far is the Distance Metric (DM) Demand Model developed by Pinkse and Slade (2004).

Following the neoclassical approach of assuming a representative consumer, the DM model has numerous advantages over the mixed logit and multiple-discreteness models. Like these latter models it alleviates the dimensionality problem, maintains the potential for flexible substitution parameters, and does so in a much more “practitioner friendly” manner, i.e., implementation of this model is much simpler than either the mixed logit or multiple-discreteness model. It also has an additional advantage over the mixed-logit model in that it does not restrict consumers to discrete choices. The one advantage that it does not possess is the ability to capture consumer heterogeneity. However, as mentioned previously, if capturing variation in substitution patterns amongst different cohorts of the population ever becomes an important issue in merger simulation research, it is likely that this variation need only be captured across broad classifications of consumer groups, not at household or individual levels (see Essay 2).

The simple idea of the DM approach is as follows. Product quantities or expenditure shares are modeled as functions of own- and cross-prices as in the neoclassical approach to demand. However, instead of having a single parameter to estimate for each cross-price (which would lead to the curse of dimensionality), the cross-price coefficients are modeled as functions of the distance between the two products as defined by a set of researcher defined metrics[21]. These distance metrics are defined in product characteristic space. For example, if the product category is beer, the metric $\left|ALC_i - ALC_j\right|$ could be used, which gives the Euclidian distance between the alcohol contents of the two products.

Though convenient, it should be noted that the direct replacement of demand parameters with functions of distance metrics fails to shed light on the underlying theoretical implications regarding utility maximizing behavior. Hanemann (1982) points out that the ideal approach is to incorporate product attributes into a utility maximization (or the dual expenditure minimization) problem from which one can derive demand equations. This approach would lead to clarification regarding any theoretical parameter restrictions imposed by the addition of functions of product attributes. Without working through the details, it appears that the DM model, to be presented below, could fall into a class of demand models derived from what Hanemann calls a Generalized-Lancaster (GL) utility maximization problem. However, verification of this "hunch" will be left

[21] For literary context, the practice of replacing model parameters with functions of product characteristics (or characteristic distance metrics) could be classified as a "translating" procedure. Lewbel (1985) shows that although this practice is frequently used to incorporate demographic variables into a demand system, other effects, such as product attributes, can be factored in as well.

for future research.

In most cases involving highly differentiated products, the number of relevant product characteristics will be less than the number of products in the category. By replacing the cross-price coefficients with functions of distance metrics, the probability of reducing the dimensionality of parameter estimation is almost certain. If further decreases in dimensionality are necessary, intercept, as well as own-price parameters can also be replaced with functions of logically appropriate characteristics. For example, since the intercept terms determine the level of each brands market share, they might well be represented by a function of brand and market level (i.e. population, per capita income, and unemployment rate) indicator variables. In like manner, own-price coefficients could be replaced with functions of characteristics such as “product type,” “number of *same type* products,” and “manufacturer identity.”

Although reduction in dimensionality is obtained by imposing additional structure on the model, Pinkse and Slade lessen the rigidity of this dimension reduction exercise by imposing no prior assumptions on the functional form of the additional structure. In other words, the functional form of researcher defined distance measures is estimated semi-parametrically.

One drawback of the models used by Pinkse and Slade is their choice of an underlying indirect utility function from which to derive demand. They use a normalized quadratic specification that results in linear demand when using cross-sectional or short panel data. Though simple, this choice results in the assumption that the income effect for each brand equals zero, which could be problematic (see Rojas, 2005). This assumption is easily avoided by applying the DM approach to the Linear Approximate Almost Ideal Demand System (LA/AIDS) (Rojas, 2005).

In this study, the DM approach will likewise be applied to the LAAIDS model. Note that the AIDS models is characterized by the following desirable properties: (i) it is derived from utility maximization, (ii) it accommodates exact (i.e. nonlinear) aggregation, (iii) it is a first-order flexible functional form approximation to any demand system, and (iv) it allows for easy implementation and testing of theoretical properties such as symmetry, and homogeneity.

The Model

Formally, let $i \in (1,...,N)$ be the index of brands, $t \in (1,...,T)$ the time index, $p_t = (p_{1t},..., p_{Nt})$ the vector of retail prices, $q_t = (q_{1t},...,q_{Nt})$ the vector of brand quantities demanded, and $X_t = \sum_i p_{it} q_{it}$ total expenditure in time *t*. Utilizing this information, the AIDS equation is given as follows:

$$w_{it} = \alpha_i + \sum_{j=1}^{N} \gamma_{ij} \ln(p_{jt}) + \beta_i \ln(X_t / P_t^*), \tag{2.1}$$

where $w_{it} = \dfrac{p_{jt} q_{jt}}{X_t}$ is the expenditure share for product *i* in time t, and $\ln P_t^*$ is a price index defined as follows:

$$\ln(P^*) = \alpha_0 + \sum_j \alpha_j \ln(p_j) + \frac{1}{2} \sum_j \sum_i \gamma_{ij} \ln(p_i) \ln(p_j) \tag{2.2}$$

In its present form, the system of *N* equations is nonlinear in parameters. A frequently used approximation is to replace (2.2) with a log linear analogue of the Laspeyeres price index (Moschini, 1995). This index is similar to Stone's price index and is expressed as:

$$\ln(P_t^*) \approx \ln(P_t) = \sum_j \overline{w}_j \ln(p_{jt}) \tag{2.3}$$

where $\overline{w}_j$ is the mean expenditure share of the *j*th good. After substituting (2.4) into (2.1) we obtain the following:

$$w_{it} = \alpha_i + \sum_{j=1}^{N} \gamma_{ij} \ln(p_{jt}) + \beta_i \ln(X_t / P_t), \tag{2.4}$$

The *(N-1)* equations of (2.4) would typically be estimated using Seemingly Unrelated Regression (SUR). Uncompensated price elasticities could then be obtained with the following equation (Green and Alston, 1990):

$$\varepsilon_{ij}^{AIDS} = -\delta_{ij} + \frac{\gamma_{ij} - \beta_i w_j}{w_i} \tag{2.5}$$

where, δ_{ij} is the Kronecker delta equal to 1 when $i = j$ and 0 otherwise. However, given that the application in this paper involves 45 products, this procedure is problematic given the large number of parameters that would have to be estimated.

To reduce the dimensionality of estimation, characteristic distance metrics will be introduced into the LA/AIDS model. To do this, one simply replaces the cross-price coefficients (γ_{ij}) with functions of different distance measures between products I and *j*. Replacing γ_{ij} in (1) with $g(\delta_{ij}^k; \lambda_k)$ gives us

$$w_{it} = \alpha_i + \gamma_{ii} \ln(p_{it}) + \sum_{j=1}^{N} g_{ij}(\delta_{ij}^k; \lambda) \ln(p_{jt}) + \beta_i \ln(X_t / P_t), \tag{2.6}$$

where δ_{ij}^k is the vector of distance metrics, *k* equals the number of researcher defined measures, and λ is the vector of parameters corresponding to each distance metric (note that this does not change with changes in *i* and *j*). The function of these metrics, $g(.)$, can be specified by the researcher. However, to allow for as much flexibility in substitution as possible, semi-parametric methods (or user directed search methods) can be used as well. The easiest way to do this is to use power series expansion methods (see Li and Racine (2006)). For example, if two continuously defined metrics were used g(.) would be specified semi-parametrically as

$$g(\delta^1, \delta^2; \lambda) = \sum_{r=0}^{R} \sum_{s=0}^{R} \lambda_{rs} (\delta^1)^r (\delta^2)^s \ , \tag{2.7}$$

where *R*, the degree of the power series expansion, is determined by the data. In practice however, this procedure is complicated by the fact that some of the distance metrics are not continuous, but are 0-1 variables. To address this problem, Pinkse and Slade (2004) recommend constructing separate g(.) functions for each value of the discrete metric. Obviously, given only a handful of discrete and continuous metrics, the complexity of the distance metric function can get out of hand quickly. These issues will become more transparent when the empirical application is discussed later on.

While the data can be used to semi-parametrically define the functional form of $g(.)$, definition of the distance metrics is left to the practitioner. For example, in the bottled juice category, one could use information regarding sugar, carbohydrates, sodium, and juice content to construct a number of continuous distance metrics. Additionally, indicator variables such as product type (e.g. Apple, Citrus, Cranberry, etc.) or brand can be used to construct discrete distance metrics.

To see how the DM method reduces the dimensionality of demand estimation, consider the following. Without imposing any theoretical demand restrictions on the LA/AIDS model, we would normally have to estimate N(N+2) parameters. Imposing symmetry, homogeneity, and adding-up reduces this to N(N+3)/2 – 1. Thus, if we were interested in estimating demand for 50 products the number of parameters could be reduced from 2600 to 1324 simply by imposing theoretical conditions. Utilizing distance metrics reduces this even further from N(N+3)/2 – 1 to 3N + K parameters (assuming that g(.) is specified as a linear combination of distance metrics). For example, suppose we have 10 distance metrics incorporated into the model. This reduces the number of parameters to be estimated from 1324 to 160! It should be noted, however, that (3N + K) is a lower bound and will increase as the functional form of g(.) becomes more complicated.

Once the substitution parameters are replaced with the function of distance metrics, the dimensionality of the system should be low enough for the system of equations to be easily estimated[22]. Estimation is then carried out using an instrumental

---

[22] As mentioned previously, if more degrees of freedom are needed, the intercept and own-price parameters can likewise be replaced with functions of product characteristics. Pinkse and Slade as well as Rojas do just that, thereby reducing their demand models to a single equation.

variables (IV) procedure such as three-stage least squares (3SLS).

In brand level demand studies the argument that retail prices are endogenous is a common one (see e.g. Hausman, Leonard, and Zona, 1994; Nevo, 2000b; Villas-Boas and Winer, 1999). Price endogeneity results from the fact that there are many unobservable brand characteristics that are likely correlated with retail prices For example, a brand's shelf-space allocation, and shelf-space location are usually unobservable to the researcher, but are very likely to be correlated with brand price.

The only drawback with using an IV estimator is that there is no theoretically acceptable method for comparing various model specifications. If regular SUR estimation were used, we could use measures such as the Bayesian Information Criterion (BIC) or Akaike's Information Criterion (AIC) to help us select the model that was the most successful at balancing fit with parsimony (Greene, 2003). Since no model selection criteria are available a slightly inconvenient solution is to simply report a range of results for the specifications considered.

After the model parameters are estimated, the uncompensated elasticities are calculated just as with the original LA/AIDS model, but with the function of distance metrics used in place of the cross-price coefficients. This substitution creates the following formula:

$$\varepsilon_{ij}^{AIDS} = -\delta_{ij} + \frac{g(\delta_{ij}^{k};\lambda_k) - \beta_i w_j}{w_i} \tag{2.8}$$

Supply-Side Model

Assuming that own- and cross-price elasticities are successfully estimated, the modeling of supply-side behavior begins by first recovering marginal costs. Assume that there are *M* manufacturers, each producing a unique set $K_1, K_2, ..., K_M$ of brands. Also assume that each firm is a profit maximizing entity and competes with the other manufacturers over prices. The profit function for the *m*th firm is:

$$\Pi^m = \sum_{k \in K_m} (p_k - c_k) q_k(P), \tag{2.9}$$

where c_k is the marginal cost of producing manufacturer *m*'s *k*th brand. Re-expressing the first order conditions in elasticity and share form obtains the following:

$$\frac{\partial \Pi^m}{\partial p_k} = w_k + \left(\frac{p_k - c_k}{p_k} \right) \varepsilon_{kk} w_k + \sum_{l \in K_m} \left(\frac{p_l - c_l}{p_l} \right) \varepsilon_{lk} w_l = 0 \qquad \forall\, k \in K_m \tag{2.10}$$

where, given that *X* is total expenditure, the demand elasticities and expenditure shares are defined by,

$$\varepsilon_{lk} = \left(\frac{\partial q_l}{\partial p_k} \right) \frac{p_k}{q_l} \quad \text{and} \quad w_k = \frac{p_k q_k}{X}$$

respectively. Using estimated demand elasticities, and mean prices and expenditure shares, we can then solve the first-order-conditions for the unknown marginal costs.

Now, suppose we want to simulate the price effects of a merger between manufacturers *m* and *n*. Let $K_m \cup K_n = K_{mn}$. The profit equation for the merged entity is

$$\Pi^{m+n} = \sum_{k \in K_{mn}} (p_k - c_k) q_k(P) \tag{2.11}$$

and the corresponding first order conditions are:

$$\frac{\partial \Pi^{m+n}}{\partial p_k} = w_k + \left(\frac{p_k - c_k}{p_k}\right)\varepsilon_{kk} w_k + \sum_{j \in K_{mn}} \left(\frac{p_j - c_j}{p_j}\right)\varepsilon_{jk} w_j = 0 \qquad \forall\, k \in K_{mn} \tag{2.12}$$

Assuming that marginal costs have not changed from their pre-merger levels and that elasticities and expenditure shares have remained the same as well, we can now solve the post-merger first-order-conditions for post-merger prices using numerical optimization routines. For comparison purposes, we then compute the percentage changes in price from their pre-merger equilibrium levels.

Data and Estimation

The Data

For this study, publicly available data from the Kilts Center for Marketing, University of Chicago was used to estimate demand and conduct merger simulations for 45 shelf stable juice products. The data include weekly store level transaction prices, quantities, and discount information for over 100 stores operated by Dominick's Finer Foods. Accounting for approximately 20 percent of market share, Dominick's is the second largest supermarket chain in Chicago. We use 68 weeks of data ranging from August 1995 to November 1996.

In addition to price and quantity data, nutritional information regarding sugar, carbohydrates, juice, vitamin C, and sodium content was obtained for each product included in the analysis. This information is readily available on the nutritional labels of each product and was retrieved from in-store-visits or manufacturer websites. Unfortunately, a strong assumption had to be made regarding nutritional information for the private label products. Current characteristic information for the private label products was used. However, for the time period corresponding to the data, Dominick's was under different ownership than it is now (Dominick's is currently owned by Safeway, who uses the same private label products in all of its stores). Therefore, it had to be assumed that the characteristics of Dominick's private label juice products did not change with the takeover by Safeway.

Data Preparation

In this dataset, the bottled juice category consists of 511 unique Universal Product Codes (UPCs), thus reflecting the high level of product differentiation. To narrow the focus a bit we needed to establish a selection rule for the products that would be considered in our demand analysis. For the 68 weeks of data we selected products that had a market share of at least ½ of one percent. This selection rule resulted in a list of 49 products to be considered, sales of which account for approximately 80% of total sales.

For each product we have weekly weighted (by movement of various sizes[23] of the same product) average price per ounce, and movement in ounces. A very attractive feature of this dataset is the inclusion of weekly profit margins from which wholesale prices can be derived. As mentioned above, we obtained nutritional data for each of these products by personally observing the product labels (in store or on the internet) or by telephone conversations with company representatives. Four of the products had to be dropped for the following reasons: 1) two Welch's Sparkling grape juice products (red and white) were dropped because these are clearly seasonal or "special occasion" products and this is reflected in their highly inflated prices (price per ounce for these products was about twice as much as the other juice products), 2) Dominick's private label Fruit Punch was dropped from the study because we could not obtain nutritional information for this product, and 3) Dominick's white grape juice was eliminated because this product appears to not have entered the market until approximately 35 weeks into the time series. See Tables 3 and 4 for a summary of data variables used in this analysis and a list of brands, flavors, and types used to create corresponding indicator variables.

[23] Products were aggregated across sizes. For example, we did not consider 32 oz Tree Top apple juice to be different from 64 oz. Tree Top apple juice. However, prices per ounce are not the same for these different sizes. Thus, we weighted the average prices by sales movement of each of the respective sizes.

TABLE 3 Essay 1 Model Variables and Their Definitions

Variables	Description
<u>Time Dependent</u>	
Retail Price	per ounce, weekly, weighted averages over all product sizes
Wholesale Price	per ounce, weekly, weighted averages over all product sizes
Quantity	ounces per week
<u>Constant Over Time</u>	
Discount	percentage of time (weeks) the product is sold on discount
Brand	zero-one indicator variable for each brand
Flavor	zero-one indicator variable for each flavor
Type	zero-one indicator variable for each Type
Sugar	grams per 8 oz. Serving
Sodium	milligrams per 8 oz. Serving
Juice	percentage of juice content in product
Vitamin C	zero-one indicator variable: 1 if >=100% DRA, 0 otherwise

TABLE 4 Bottled Juice Brands, Flavors, and Product Types

Brands:	1	Ocean Spray
	2	Dominick's
	3	Gatorade
	4	Mott's
	5	Hawaiian Punch
	6	Welch's
	7	HI-C
	8	MinuteMaid
	9	Musselman
	10	Indian Summer
	11	Treetop
	12	Libby
	13	Veryfine
Flavors:	1	Apple
	2	Cranberry
	3	Orange
	4	Lemon
	5	Grape
	6	Grapefruit
	7	Punch
	8	Cranblends
	9	Other
Type:	1	Everyday Juices (not Isotonics)
	2	Isotonics (Energy Drinks)

For a breakdown of the final 45 products with average prices, market shares, and product attributes see Table 5. As can be seen from Table 5, it is readily apparent how one could devise a continuous distance metric for sugar, juice content, or sodium. However, for daily-recommended-allowance of vitamin C, most of the products have either ≥ 100 vitamin C content or much less than 100. This implies that a discrete distance metric would be more appropriate for this product attribute.

Creating Continuous Distance Metrics

The main purpose of the continuous distance metrics is to help identify the patterns of global competition within a product category. However, the concept of global competition in the DM model differs significantly from its original definition as presented by Chamberlin (1962), Spence (1976) and Dixit and Stiglitz (1977), in that competition is asymmetric[24]. In other words, products, as located within some *K*-dimensional continuously defined attribute space, compete with all other products within that space, but the relative strength of the competition is determined by how close together the products are within the attribute space. To begin defining this continuous attribute space, four single-dimension distance metrics were created and are given in the equations below.

[24] The original concept of global competition assumed that the cross-price elasticities for all products within a category were equal.

TABLE 5 Bottled Juice Products, Shares, and Attribute Data

#	NAME	Category Share	Sugar g.	Juice %	vitaminC %DRA	Sodium mg.	Discount
1	Dom. Apple Juice	8.15%	28	100	130	35	20.04%
2	OS Cranberry Juice Cocktail	7.19%	33	27	100	35	8.40%
3	Mott's Regular Apple Juice	6.85%	28	100	20	10	5.22%
4	Gatorade Lemon-Lime	3.89%	14	0	0	110	6.17%
5	Welch's White Grape	2.94%	37	100	100	20	39.85%
6	OS Ruby Red	2.67%	30	30	100	65	11.71%
7	Dom. Cranberry Juice	2.50%	35	100	130	35	11.39%
8	Musselman Apple Juice	2.45%	26	100	0	25	19.88%
9	OS Cranapple Drink	2.39%	35	15	100	80	11.35%
10	OS Cranraspberry Drink	2.37%	30	15	100	80	13.99%
11	Gatorade Orange	2.22%	14	0	0	110	22.12%
12	Hawaiian Punch	2.12%	28	5	100	120	6.53%
13	Gatorade Fruit Punch	1.96%	14	0	0	110	6.93%
14	Indian Summer Apple Juice	1.90%	25	100	7	15	6.80%
15	Gatorade Lemon-Ice Punch	1.86%	14	0	0	110	38.89%
16	Welch's Regular Grape	1.81%	40	100	100	20	5.75%
17	Mott's Natural Apple Juice	1.61%	27	100	0	10	9.04%
18	OS Ruby Red & Tangerine	1.60%	31	20	100	65	5.55%
19	Treetop Apple Juice	1.58%	26	100	0	25	19.32%
20	Gatorade Tropical Burst	1.39%	14	0	0	110	8.54%
21	OS Low Calorie Cranberry	1.39%	10	27	100	75	9.10%
22	HI-C Fruit Punch	1.10%	29	5	100	30	9.05%
23	Minute Maid Apple Juice	1.06%	26	100	100	20	9.15%
24	OS Grapefruit Juice	1.05%	21	100	100	35	12.27%
25	OS Crancherry Drink	0.99%	32	15	100	35	7.65%
26	HI-C Orange	0.99%	31	5	100	30	22.08%
27	Gatorade Watermelon	0.98%	14	0	0	110	4.81%
28	Dom. Ruby Red Grapefruit	0.95%	35	30	130	35	7.61%
29	Gatorade Blue Raspberry	0.91%	14	0	0	110	16.55%
30	OS Crangrape Drink	0.90%	35	15	100	80	19.63%
31	Gatorade Grape	0.85%	14	0	0	110	4.17%
32	OS Low Calorie Cranraspberry	0.84%	10	20	100	70	13.48%
33	Dom. Cranraspberry Drink	0.83%	35	100	130	35	15.41%
34	Libby Punch	0.78%	26	100	120	20	25.11%
35	Dom. Cranapple Drink	0.76%	40	27	130	35	15.09%
36	OS Pink Grapefruit	0.75%	25	100	100	35	9.50%
37	Dom. Reg. Grapefruit	0.71%	24	100	100	35	21.43%
38	Gatorade Lemonade	0.71%	14	0	0	110	4.58%
39	Libby Berry	0.69%	26	100	120	10	25.49%
40	HI-C Ecto Cooler	0.67%	31	5	100	30	9.20%
41	Gatorade Brand Citrus	0.66%	14	0	0	110	4.62%
42	Libby Cherry	0.59%	27	100	120	20	25.36%
43	Libby Grape	0.57%	28	100	120	20	30.56%
44	Veryfine Apple Juice	0.57%	32	100	100	40	12.12%
45	OS Cranstrawberry	0.57%	30	15	100	80	10.32%

$$\delta_{ij}^{Sugar} = \frac{1}{1+2\sqrt{\left(Sugar_i - Sugar_j\right)^2}}$$

$$\delta_{ij}^{Sodium} = \frac{1}{1+2\sqrt{\left(Sodium_i - Sodium_j\right)^2}}$$

$$\delta_{ij}^{Juice} = \frac{1}{1+2\sqrt{\left(Juice_i - Juice_j\right)^2}}$$

$$\delta_{ij}^{Discount} = \frac{1}{1+2\sqrt{\left(Discount_i - Discount_j\right)^2}}, \qquad (2.13)$$

where $\sqrt{(Attribute_i - Attribute_j)^2}$ are single-dimension Euclidian distances and $\delta_{ij}^{k} \in (0,1]$. It is easy to see that these metrics provide a continuously defined indication of the proximity of each product along a particular dimension. For example, if product *i* and *j* have the same sugar content, the sugar metric reaches its maximized value of 1. However, as the distance in sugar space between products i and j grows, the metric approaches a value of zero. We are not restricted to defining one-dimensional metrics only. For example, instead of the four metrics above, we could define a single metric that measures the proximity of the products in a four dimensional space using a multi-dimensional Euclidian distance measure:

$$\delta_{ij}^{SSJD} = \frac{1}{1+2\sqrt{(Su_i - Su_j)^2 + (So_i - So_j)^2 + (J_i - J_j)^2 + (D_i - D_j)^2}} \qquad (2.14)$$

However, for exploratory purposes we will begin by using the single-dimensional attributes to determine which ones are most influential in determining patterns of substitution. While admitting that the functional form of these metrics is somewhat ad hoc, Pinkse and Slade point out that the decision regarding how to specify the proximity measures should not matter since semi-parametric estimation procedures will be used. To get a flavor of the metrics obtained, see Table 6, which provides metrics in sugar-space for the first 10 products used in the analysis.

TABLE 6 Sampling of Continuous Distance Metric Values: Sugar Proximity

PRODUCT #	1	2	3	4	5	6	7	8	9	10
1	1	.09	1.00	.03	.05	.20	.07	.20	.07	.20
2	.09	1	.09	.03	.11	.14	.20	.07	.20	.14
3	1.00	.09	1	.03	.05	.20	.07	.20	.07	.20
4	.03	.03	.03	1	.02	.03	.02	.04	.02	.03
5	.05	.11	.05	.02	1	.07	.20	.04	.20	.07
6	.20	.14	.20	.03	.07	1	.09	.11	.09	1.00
7	.07	.20	.07	.02	.20	.09	1	.05	1.00	.09
8	.20	.07	.20	.04	.04	.11	.05	1	.05	.11
9	.07	.20	.07	.02	.20	.09	1.00	.05	1	.09
10	.20	.14	.20	.03	.07	1.00	.09	.11	.09	1

Discrete Distance Metrics

Using the indicator variables defined in Table 3, as well as the continuous attribute information, we can create a host of discrete distance metrics that are used to represent the forces of local competition in defining product substitution patterns. Note that in the traditional literature regarding local competition, it was assumed that goods only compete with their two nearest neighbors, one on either side, along some single dimensional space (see e.g. Hotelling, 1929; Salop, 1979; and Gabszewicz and Thisse, 1979).

The most intuitive place to begin is with the indicator variables. Thus, we begin by creating zero-one distance metric variables as follows:

$$\delta_{ij}^{VitC} = \begin{cases} 1 \text{ if products } i \text{ and } j \text{ have the same vitamin C content} \\ 0, \text{ otherwise} \end{cases}$$

$$\delta_{ij}^{Brand} = \begin{cases} 1 \text{ if products } i \text{ and } j \text{ are the same brand} \\ 0, \text{ otherwise} \end{cases}$$

$$\delta_{ij}^{Flavor} = \begin{cases} 1 \text{ if products } i \text{ and } j \text{ are the same flavor} \\ 0, \text{ otherwise} \end{cases}$$

$$\delta_{ij}^{Type} = \begin{cases} 1 \text{ if products } i \text{ and } j \text{ are the same type} \\ 0, \text{ otherwise} \end{cases} \tag{2.15}$$

The intuition behind these metrics is easy to understand. The Vitamin C metric simply indicates whether or not the two products have the same Vitamin C content. Many shoppers are brand faithful. Thus, there exists the possibility of stronger within brand substitution patterns, which is picked up by the zero-one “BRAND” distance metric. Even more obvious is the assumption that products characterized by the same flavor should be stronger substitutes in consumption. Finally, about one quarter of the products in this analysis can be classified as energy drinks or isotonics. One could debate the inclusion of these products within a bottled juice study, yet there is some evidence that competition between bottled juices and energy drinks does exist (see Capps, Clausen, and Pofahl, 2004). The fact that many retailers shelve bottled juices and energy drinks on the same aisle is also supportive of their inclusion. However, we would still expect substitution to be stronger within the type groupings as opposed to across groupings, thus we define the "Type" discrete metric to indicate this.

An exciting, and somewhat overwhelming, feature of the distance metric approach is the ability to use continuously measurable product attributes to define even more indicators of local competition. Some diagrams will help develop the intuition of these metrics. Known as *Voronoi diagrams*, Figures 3-5 provide a mapping of all 45 products in 2-dimensional attribute spaces. For example, in Figure 3 each point represents a product's location in sugar/sodium space. Note however, that some dots represent more than one product. For example, all ten Gatorade products are located at the same point in Figure 3. The borders in these diagrams are constructed such that all points within a cell are located closer to the product(s) represented by the cell than any other product on the map. Formally, an arbitrary point *(x, y)* is in a cell corresponding to product *i*, located at (x_i, y_i), if and only if

$$\sqrt{(x-x_i)^2+(y-y_i)^2} < \sqrt{(x-x_j)^2+(y-y_j)^2}$$

for all $j \neq i$. For example, if my search for a juice product is solely determined by sugar and sodium content, and if I would like a product that has anywhere from 27-40 grams of sugar, but no more than 10 milligrams of sodium per serving, then the closest product that fits my preferences is Mott's Regular Apple Juice[25].

[25] This may not appear to be the case when looking at the diagram. However, it should be noted that this is only because the figures are not scaled the same on both axis.

FIGURE 3
MAPPING OF 45 BOTTLED JUICE PRODUCTS IN SUGAR/SODIUM SPACE

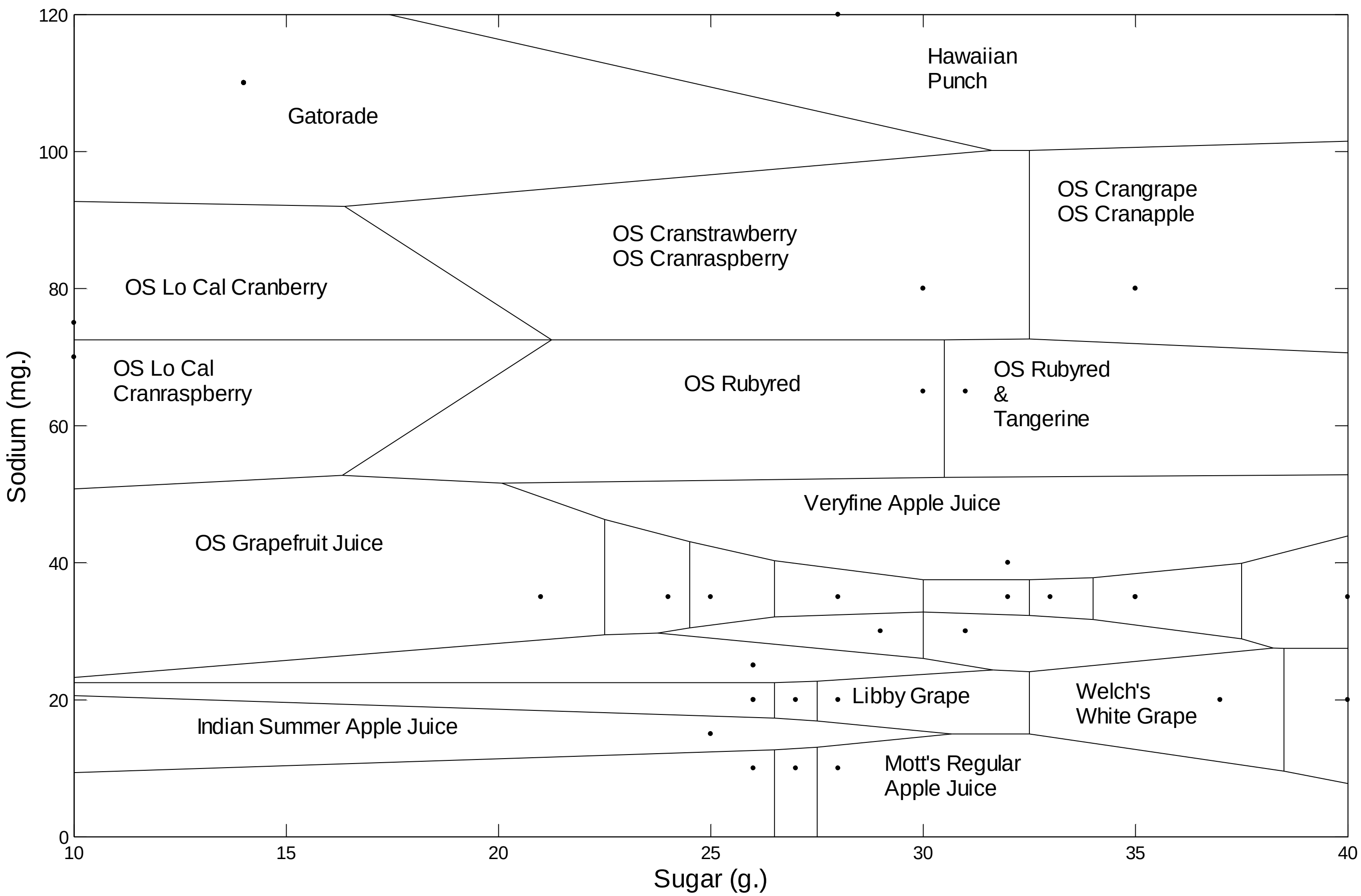


FIGURE 4
MAPPING OF 45 BOTTLED JUICE PRODUCTS IN JUICE/SUGAR SPACE

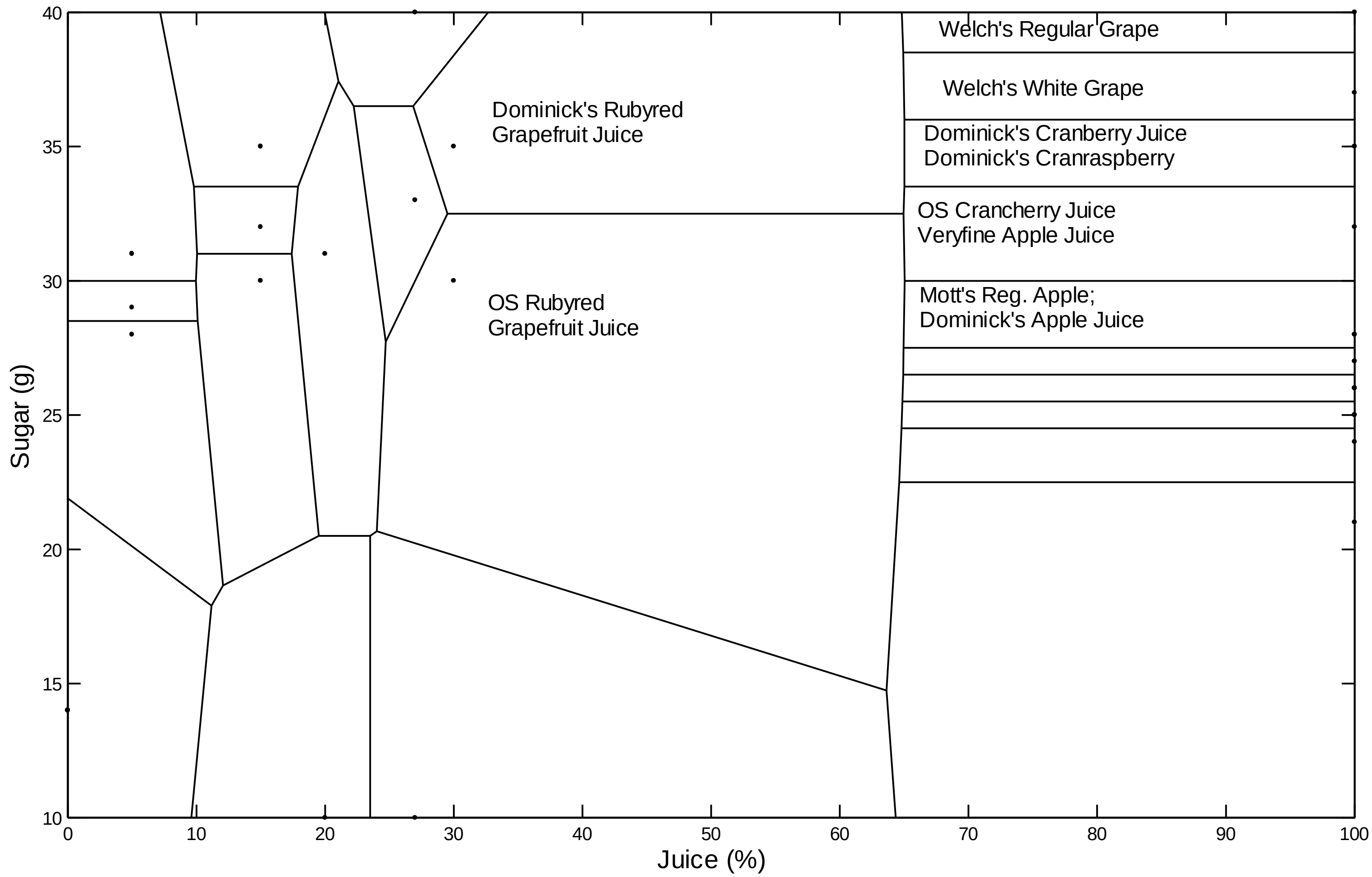
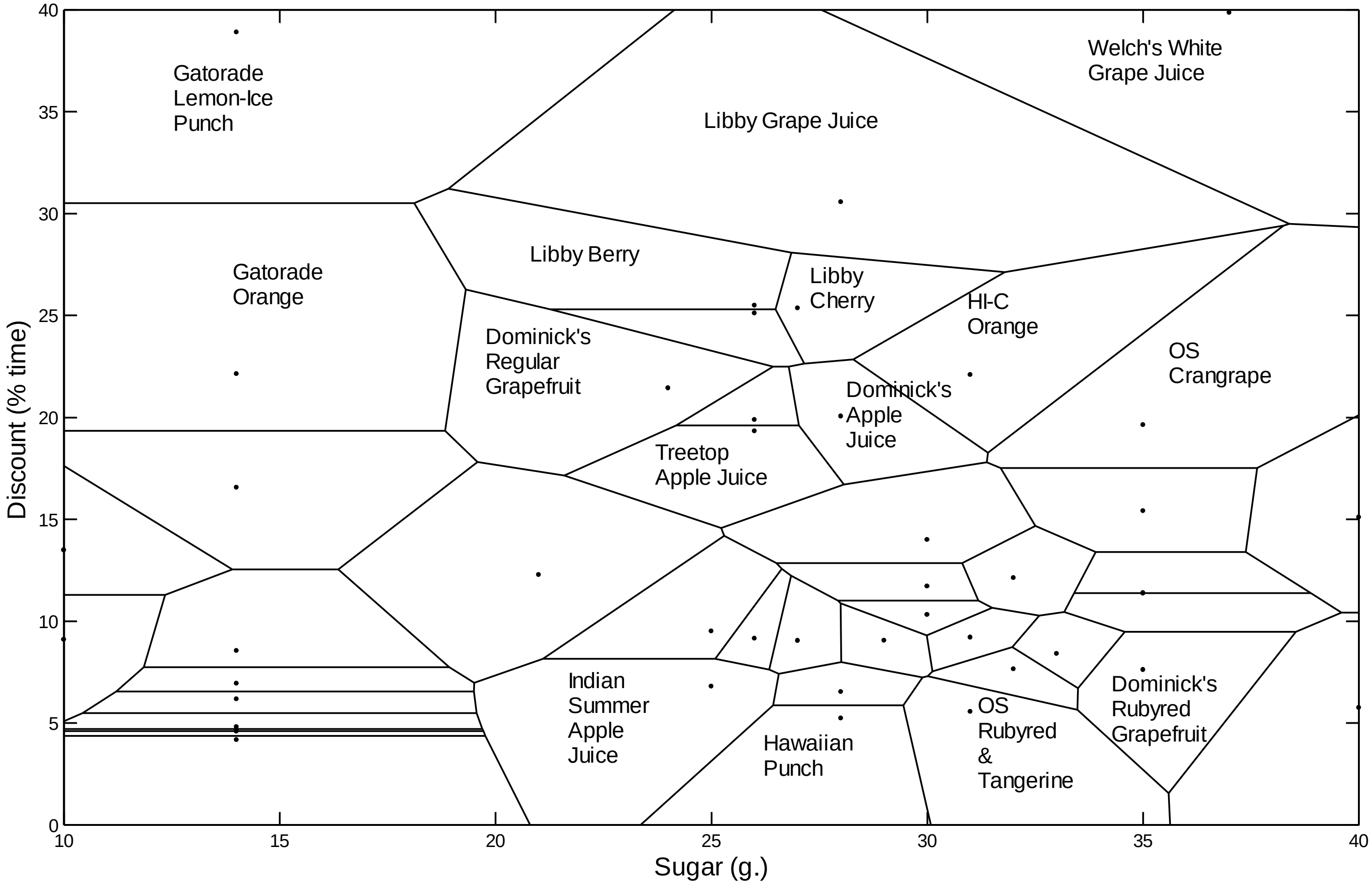
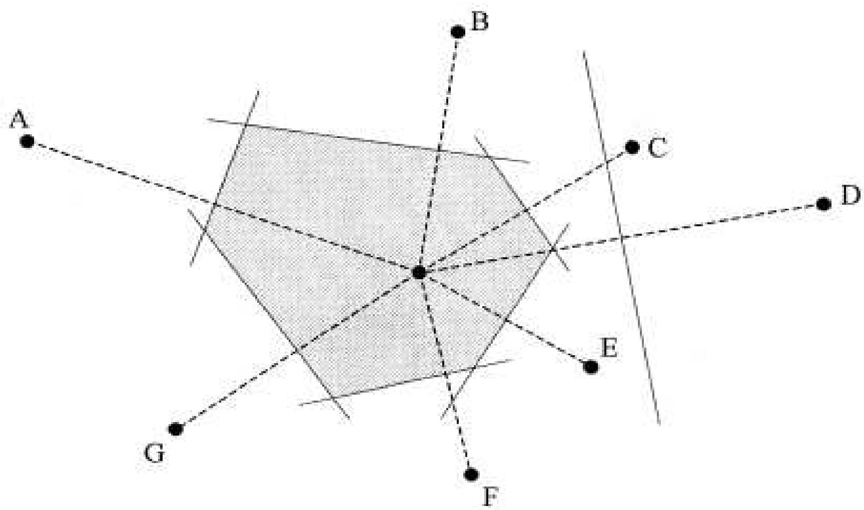


FIGURE 5
MAPPING OF 45 BOTTLED JUICE PRODUCTS IN SUGAR/DISCOUNT SPACE



To get a better idea of how the cells in Figures 3-5 are created see Figure 6 below. First, each point is connected to all others and the midpoints of these rays are located. At the midpoints, perpendicular lines are drawn. The cell is then constructed by the convex polygon that results from the innermost intersections of the perpendicular lines.

FIGURE 6
CONSTRUCTION OF CONVEX POLYGONS IN VORONOI DIAGRAMS



Source: Kalnins (2003)

There are several discrete distance metrics that can be created based on the information contained in Figures 3-5. We will refer to the first group as “Nearest Neighbor” metrics. Corresponding to the figures above we could define the following:

$$\delta_{ij}^{NNSS} = \begin{cases} 1, \text{if products } i \text{ and } j \text{ are nearest neighbors in sugar/sodium space} \\ 1/2, \text{if product } i\ (j) \text{ is product } j\text{'s } (i\text{'s}) \text{ nearest neighbor but not vice versa} \\ 0, \text{otherwise} \end{cases}$$

$$\delta_{ij}^{NNSD} = \begin{cases} 1, \text{if products } i \text{ and } j \text{ are nearest neighbors in sugar/discount space} \\ 1/2, \text{if product } i\ (j) \text{ is product } j\text{'s } (i\text{'s}) \text{ nearest neighbor but not vice versa} \\ 0, \text{otherwise} \end{cases}$$

$$\delta_{ij}^{NNJS} = \begin{cases} 1, \text{if products } i \text{ and } j \text{ are nearest neighbors in juice/sugar space} \\ 1/2, \text{if product } i\ (j) \text{ is product } j\text{'s } (i\text{'s}) \text{ nearest neighbor but not vice versa} \\ 0, \text{otherwise} \end{cases}$$

(2.16)

Nearest neighbor metrics do not have to be defined for two-dimensional space only. They can be created in any Euclidian space ranging from one dimension to K dimensions. This fact will come in handy later on when we are trying to reduce the complexity of the distance metric function.

Although we do not use them in this study, common boundary metrics can be created with the following:

$$\delta_{ij}^{CB} = \begin{cases} 1, \text{ if products } i \text{ and } j \text{ share a common boundary} \\ 0, \text{otherwise} \end{cases},$$

where the common boundaries are given in the diagrams. While the transition from two-dimensional to K-dimensional nearest neighbor metrics is very easy, the same cannot be said of the common boundary metrics. In three-dimensional space, common boundaries would be defined by surfaces, and with four-dimensional space, the common boundaries would be three-dimensional objects. Another way in which the Voronoi diagrams can be used is to count the number of common boundary neighbors. If it is necessary or desirable to use a function of attributes in place of the own-price coefficients, the number of common boundary neighbors is a logical choice to help determine own-price elasticities. However, again, this could be very challenging to do if common boundaries are determined in anything more than two-dimensional space.

Estimation

For this study, the primary goal of estimation will be to determine whether or not a system of 44 equations can be estimated using the DM approach. Recall that in Pinkse and Slade (2004) and Rojas (2005), the demand system was reduced to a single equation by imposing additional structure on the intercepts and own-price coefficients. While it may seem intuitive to specify all model parameters as functions of product attribute levels or proximity metrics, it also creates the potential for degrading multi-collinearity (Pinkse & Slade, 2004; Rojas, 2005). And no matter how intuitive the attributes may be, some would perhaps argue that structure should never be imposed unless it is absolutely necessary. Recalling that the “ideal” demand model for differentiated products should be as flexible as possible given necessary reductions in dimensions, it seems that the logical process to follow would be to impose the DM structure in partial increments.

To begin this process, a simple linear structure incorporating 12 distance metrics is used to investigate the relative value of each metric. The function of these metrics is given by:

$$
\begin{aligned}
g(\delta_{ij};\lambda) = \lambda_0 + &\underbrace{\lambda_1\delta_{ij}^{Brand} + \lambda_2\delta_{ij}^{Flavor} + \lambda_3\delta_{ij}^{VitC} + \lambda_4\delta_{ij}^{Type}}_{\text{Discrete Metrics}} \\
&+ \underbrace{\lambda_5\delta_{ij}^{Sugar} + \lambda_6\delta_{ij}^{Sodium} + \lambda_7\delta_{ij}^{Juice} + \lambda_8\delta_{ij}^{Discount}}_{\text{Continuous Metrics}} \\
&+ \underbrace{\lambda_9\delta_{ij}^{NNSu} + \lambda_{10}\delta_{ij}^{NNSo} + \lambda_{11}\delta_{ij}^{NNJ} + \lambda_{12}\delta_{ij}^{NND}}_{\text{Nearest Neighbor Metrics}}
\end{aligned}
\tag{2.17}
$$

The continuous and discrete metrics are defined in (2.13) and (2.15) above. The nearest neighbor metrics are similar to those in (2.16) except that these are defined in one-dimensional space. Substitution of (2.17) into an the AR(1) corrected LA/AIDS share equations will be referred to as SPEC1. Note that in addition to correcting for serial correlation, a SUMMER dummy variable was used to pick up any variation due to seasonality. Estimation of the 44-equation system will proceed using an instrumental variables procedure. However, the choice of instruments must be discussed first.

As mentioned previously, a common theme in the literature regarding brand level demand analysis is price endogeneity. Many creative solutions have been used to account for price endogeneity. Production input data (Baker and Bresnahan, 1985; Villas-Boas, 2004), prices in other markets (Hausman et al, 1994), and rival product characteristics (Berry, Levinsohn, and Pakes, 1995) have all been used as instruments for endogenous prices. Pinkse and Slade (2004) create price instruments by interacting rival product characteristics with matrices of distance metrics. In this paper, the availability of wholesale prices will be taken advantage of and used as instruments for retail price. Other authors using the Dominick's data have achieved good results using wholesale price information as instrumental variables (Chintagunta, Dube, and Singh, 2003).

Pinkse and Slade (2004) as well as Rojas (2005) began estimation with "base" models with which they identified, via parameter levels and p-values, those metrics that should remain in the model and those that should be dropped. Using a final selection of metrics they then explored series expansions of these metrics and selected the model with the best fit. Initially it was hoped that estimation of SPEC1 would serve as a similar base model in this study. However, very few of the distance metric parameters were statistically insignificant. This situation presents a problem in that it is not feasible to engage in a satisfactory use of non-parametric series expansion methods when the number of variables being expanded is large (Li and Racine, 2006). The approach taken then will be to, somewhat systematically, explore different combinations of discrete and continuous metrics and the range of substitution patterns they predict. Twenty-two specifications result from which elasticities are estimated and then used to investigate the sensitivity of post merger price simulations to model specification.

A complete list of the distance metrics used can be found in Table 7 below. Table 8 contains a list of the 22 model specifications used. Note that in each specification, the only thing that changes in the LA/AIDS share equations is the function

TABLE 7 Distance Metrics Used in Demand Model Specifications

Discrete Metrics : defined as in (2.15)		
DB_{ij}	=	BRAND metric
DF_{ij}	=	FLAVOR metric
DC_{ij}	=	VITAMIN C metric
DT_{ij}	=	TYPE metric
Nearest Neighbor (NN) Metrics : defined as in (2.16)		
$NNSu_{ij}$	=	NN in SUGAR space
$NNSo_{ij}$	=	NN in SODIUM space
NNJ_{ij}	=	NN in JUICE space
NND_{ij}	=	NN in DISCOUNT space
$NNSJD_{ij}$	=	NN in SUGAR/JUICE/DISCOUNT space
Continuous Metrics :		
CSu_{ij}	=	proximity in SUGAR space
CSo_{ij}	=	proximity in SODIUM space
CJ_{ij}	=	proximity in JUICE space
CD_{ij}	=	proximity in DISCOUNT space
$CSJD_{ij}$	=	proximity in SUGAR/JUICE/DISCOUNT space

TABLE 8 Distance Metric Function Specifications

Specification	Distance Metrics Used	Oder of Power Series Expansion
SPEC1	DB, DF, DC, DT, NNSu, NNSo, NNJ, NND, CSu, CSo, CJ, CD	1st order
SPEC2	Same as above, but minus DC and CSo	1st order
SPEC3	DF, CSJD	1st order
SPEC4	DF, CSJD	2nd order
SPEC5	DF, CSJD	3rd order
SPEC6	DF, CSJD	4th order
SPEC7	NNSJD, DF, CSJD	1st order
SPEC8	NNSJD, DF, CSJD	2nd order
SPEC9	NNSJD, DF, CSJD	3rd order
SPEC10	NNSJD, DF, CSJD	4th order
SPEC11	DB, DF, CSJD	1st order
SPEC12	DB, DF, CSJD	2nd order
SPEC13	DB, DF, CSJD	3rd order
SPEC14	DB, DF, CSJD	4th order
SPEC15	DT, DF, CSJD	1st order
SPEC16	DT, DF, CSJD	2nd order
SPEC17	DT, DF, CSJD	3rd order
SPEC18	DT, DF, CSJD	4th order
SPEC19	DF, CSu	1st order
SPEC20	DF, CJ	1st order
SPEC21	CSu	1st order
SPEC22	CJ	1st order

Note: see table 7 for definitions of the acronyms above

of distance metrics that is used to replace the original cross-price coefficients. Thus, the information in Table 8 only makes reference to these functions. To add to the clarity of Table 8 two examples are provided below demonstrating how the power series expansion is carried out when discrete variables are involved.

To see how the series expansion is carried out when a single discrete distance metric is involved, SPEC6 is presented below. It is written as follows:

$$g(\delta_{ij};\lambda) = \underbrace{DF_{ij}(\lambda_0 + \lambda_1 CSJD_{ij} + \lambda_3 (CSJD_{ij})^2 + \lambda_4 (CSJD_{ij})^3 + \lambda_5 (CSJD_{ij})^4)}_{\text{this portion corresponds to same flavor products}}$$

$$+ \underbrace{(1 - DF_{ij})(\lambda_6 + \lambda_7 CSJD_{ij} + \lambda_8 (CSJD_{ij})^2 + \lambda_9 (CSJD)^3 + \lambda_{10} (CSJD)^4)}_{\text{this portion corresponds to different flavored products}} \quad (2.18)$$

A function containing two discrete metrics, such as SPEC12 is defined as:

$$g_{ij}(\delta;\lambda) = \underbrace{WB_{ij}(DF_{ij}(\lambda_0 + \lambda_1 CSJD_{ij} + \lambda_2 (CSJD_{ij})^2))}_{\text{same brand / same flavor}}$$

$$+ \underbrace{WB_{ij}(1 - DF_{ij})(\lambda_3 + \lambda_3 CSJD_{ij} + \lambda_4 (CSJD_{ij})^2)}_{\text{same brand / different flavor}}$$

$$+ \underbrace{(1 - WB_{ij})(DF_{ij}(\lambda_5 + \lambda_6 CSJD_{ij} + \lambda_7 (CSJD_{ij})^2))}_{\text{different brand / same flavor}}$$

$$+ \underbrace{(1 - WB_{ij})(1 - DF_{ij})(\lambda_8 + \lambda_9 CSJD_{ij} + \lambda_{10} (CSJD_{ij})^2)}_{\text{different brand / different flavor}} \quad (2.19)$$

It is easy to see that anything more than two discrete distance metrics can add a lot of complexity to the DM function. This is one reason why a single multi-dimensional continuous metric (CSJD) was used for most of the specifications. As will be seen in the results, the only continuous DM that had an insignificant coefficient was the sodium metric. After dropping the sodium metric from future specification consideration, a decision had to made with respect to whether or not to keep the continuous metrics defined in one-dimensional Euclidian space or to combine them. Motivated by the logic that consumers perceive products as simultaneous bundles of attributes, we concluded that a three-dimensional Euclidian measure should be used. An advantage of this assumption is that it alleviates one potential source of complexity in the DM function. It has already been demonstrated how the inclusion of multiple discrete metrics increases the dimensions of the DM function. Consider what would happen to equation (2.19) if three one-dimensional continuous DMs were used in place of the single three-dimensional one. The number of parameters in (2.19) would increase from 12 to 108!

Estimation and Simulation Results

Before estimating the 22 model specifications, the use of wholesale prices as instruments for retail prices needs justification. In order for wholesale prices to be considered good instruments, we must show that they are highly correlated with the endogenous retail prices, yet uncorrelated with the disturbance terms (Greene, 2003). As an informal test, SPEC1 was initially estimated using seemingly unrelated regression and the error terms for each equation were saved. After stacking the price data, retail prices were regressed on wholesale prices to determine the strength of correlation between the two. Finally, to insure that wholesale prices were not correlated with the disturbances, wholesale prices for each product were regressed on the error terms from corresponding SUR share equations. Results from these preliminary regressions can be found in Table 9. It appears that wholesale prices do a relatively good job of explaining retail prices variation and as well are not correlated with the right-hand-side error terms. A detailed explanation as to when and why wholesale prices make good instruments for retail prices can be found in Chintagunta (2002).

Using wholesale prices as instruments, the twenty-two model specifications were then estimated. With only a handful of exceptions, own-price coefficients are all negative and statistically significant at the 5% level. On the other hand, the majority of β coefficients (see equation (2.6)) corresponding to the normalized expenditure term are not statistically significant. Additionally, it does not appear that the summer months in Chicago play a significant role in explaining bottled juice share variation, as the seasonal indicator coefficients are statistically significant in only a portion of the equations. All of these parameters along with their p-values can be found in Appendix A.

TABLE 9 Fit Statistics for Determining the Relative Usefulness of Using Wholesale Prices as Instrumental Variables for Retail Prices

Regression	Fit*	Regression	Fit*
RPs on WPs	0.72		
WP1 on ERROR1	0.01	WP23 on ERROR23	0.07
WP2 on ERROR2	0.02	WP24 on ERROR24	0.20
WP3 on ERROR3	0.00	WP25 on ERROR25	0.00
WP4 on ERROR4	0.01	WP26 on ERROR26	0.04
WP5 on ERROR5	0.02	WP27 on ERROR27	0.01
WP6 on ERROR6	0.12	WP28 on ERROR28	0.00
WP7 on ERROR7	0.02	WP29 on ERROR29	0.00
WP8 on ERROR8	0.03	WP30 on ERROR30	0.00
WP9 on ERROR9	0.09	WP31 on ERROR31	0.09
WP10 on ERROR10	0.00	WP32 on ERROR32	0.00
WP11 on ERROR11	0.03	WP33 on ERROR33	0.01
WP12 on ERROR12	0.01	WP34 on ERROR34	0.16
WP13 on ERROR13	0.02	WP35 on ERROR35	0.00
WP14 on ERROR14	0.01	WP36 on ERROR36	0.10
WP15 on ERROR15	0.04	WP37 on ERROR37	0.00
WP16 on ERROR16	0.02	WP38 on ERROR38	0.01
WP17 on ERROR17	0.03	WP39 on ERROR39	0.00
WP18 on ERROR18	0.02	WP40 on ERROR40	0.07
WP19 on ERROR19	0.02	WP41 on ERROR41	0.00
WP20 on ERROR20	0.00	WP42 on ERROR42	0.00
WP21 on ERROR21	0.00	WP43 on ERROR43	0.03
WP22 on ERROR22	0.12	WP44 on ERROR44	0.00

* R-squared
Note: RP stands for 'Retail Price'; WP stands for 'Wholesale Price'
IV stands for 'Instrumental Variables'

Table 10 contains parameter estimates corresponding to the distance metrics used in the first six model specifications. From the SPEC1 results we learn that brand-, flavor-, and type-equality all make a significant impact in explaining substitution patterns. The flavor/price interaction term has the largest coefficient of the significant discrete metric terms. It is not surprising that flavor plays a stronger role than brand and type equality. If a consumer wants apple juice and their favorite product is not available or its price increases, it does not seem all that likely that they would substitute away to a product with an alternative flavor. Somewhat of a surprise is the finding that similarity in Vitamin C content does not play a significant role in the model. As for the continuous metrics, coefficients for sugar, juice, and discount were all statistically significant. The

TABLE 10 DM Function Parameter Estimates for the First Six Specifications

Coefficient for:	SPEC1 Estimate	SPEC2 Estimate	SPEC3 Estimate	SPEC4 Estimate	SPEC5 Estimate	SPEC6 Estimate
lnPj	.0007	.0007				
DB*lnPj	-.0015	-.0014				
DF*lnPj	.0019	.0019	.0019	.0004	.0010	.0017
DC*lnPj	0.0002**					
DT*lnPj	.0005	.0006				
CSu*lnPj	.0051	.0052				
CSo*lnPj	0.0005**					
CJ*lnPj	-.0110	-.0106				
CD*lnPj	-.0025	-.0024				
NNSu*lnPj	-.0036	-.0037				
NNSo*lnPj	-.0023	-.0018				
NNJ*lnPj	.0127	.0124				
NND*lnPj	.0112	.0111				
DF*(CSJD)*lnPj			.0200	.0723	.0412	-0.0015**
DF*(CSJD^2)*lnPj				-.1349	0.08**	.5275
DF*(CSJD^3)*lnPj					-.3201	-1.6995
DF*(CSJD^4)*lnPj						1.2122
(1 - DF)*lnPj			.0008	.0008	.0008	.0006
(1 - DF)*(CSJD)*lnPj			-.0021	0.0004**	0.0006**	.0217
(1 - DF)*(CSJD^2)*lnPj				-.0096	-0.0088**	-.3258
(1 - DF)*(CSJD^3)*lnPj					-0.0035**	1.0927
(1 - DF)*(CSJD^4)*lnPj						-.9784

** Statistically insignificant at the 10% level
DM = distance metric
lnPj = natural log of the price of good j; ^ = exponent operator; * = multiplication operator; see table 7 for other acronym definitions.

coefficient for sodium proximity, however, was not significant[26]. An interesting pattern to note is the difference between parameter groups in SPEC3-SPEC6. Recall that the first portion of these DM functions accounts for the affects of the CSJD proximity measure as interacted with the natural log of prices, for those products that are characterized by the *same flavor*. It comes as no surprise that the coefficients of these *same flavor* interaction terms are larger in absolute value than their *different* flavor counterparts. In simple terms, this implies that when products have the same flavor, the proximity of those products in continuous attribute space (i.e. sugar, juice, and discount) plays a much larger role in determining substitution patterns than when the products are not the same flavor. It may help to imagine a shopper standing in the juice aisle with two bottles of grapefruit juice in hand. It makes sense that if he is trying to decide between those two products, he will likely pay much closer attention to attributes other than flavor, than if he were trying to decide between grapefruit and say apple juice. This pattern is consistent throughout all of the specifications that interact discrete and continuous DMs. The remaining coefficients can be found in Appendix A.

One reason for estimating twenty-two models is that there is no strong indication either from parameter estimates or model fit diagnostics as to make one specification a

---

[26] As an interesting side-note; before settling in on a decision as to which products should or should not be included in the category, four tomato juice products were allowed into the mix. The problem with these products is that their sodium content is so high (an average of 572.5 mg) compared to the other juice products (an average of 55.8 mg) that this attribute was having an undue influence on the substitution patterns.

clear winner over the others. A look at fit measures averaged across the different models, along with their standard deviations, provides a good indication of what is meant. These fit statistics, along with averages and standard deviations of Durbin Watson statistics can be found in Table 11.

Elasticity Results

Using equation (2.8) $44 \times 44 \times 22 = 40{,}678$ retail price elasticities were estimated. Overall, roughly 97 percent of these estimates are statistically significant at the 5 percent level. Of the 968 own-price elasticity estimates, 99 percent of them are statistically significant and only 7 of them have the “wrong” sign (i.e. are positive). There is no doubt that substitution dominates the bottle juice category. Roughly 97 percent of the cross-price elasticities are positive! Because of the huge amount of results, the majority of output can be found in Appendix B. However, to “get a flavor” of the results, a subset will be presented below. Table 12 contains the average own-price elasticities over all 22 model specifications. The standard deviations are presented as well and give an indication of the overall lack of major variation in the results.

TABLE 11 Fit and Autocorrelation Statistics Averaged Across All 22 Demand Specifications

Share	Adjusted R-Squared		Durbin-Watson		Share	Adjusted R-Squared		Durbin-Watson	
Equation	Mean	SD	Mean	SD	Equation	Mean	SD	Mean	SD
1	.814	.003	2.455	.021	23	.281	.041	2.595	.034
2	.844	.002	2.577	.012	24	.280	.088	2.922	.040
3	.896	.002	1.941	.031	25	.803	.023	2.748	.031
4	.793	.007	2.575	.031	26	.738	.026	2.376	.045
5	.791	.007	2.485	.033	27	.785	.012	2.643	.033
6	.772	.014	2.959	.040	28	.466	.015	3.071	.016
7	.677	.020	2.655	.024	29	.849	.006	2.126	.026
8	.893	.005	2.640	.026	30	.739	.037	2.778	.081
9	.852	.009	2.662	.048	31	.954	.015	1.807	.163
10	.829	.022	2.764	.045	32	.756	.018	2.218	.079
11	.838	.002	2.499	.021	33	.735	.020	2.530	.072
12	.766	.005	2.423	.024	34	.710	.031	2.478	.134
13	.835	.007	2.210	.058	35	.758	.023	2.511	.056
14	.891	.002	2.712	.028	36	.512	.024	2.789	.098
15	.840	.003	2.240	.024	37	.436	.025	2.869	.032
16	.584	.026	2.538	.073	38	.815	.011	2.586	.154
17	.912	.011	2.470	.078	39	.771	.035	2.706	.138
18	.695	.034	2.581	.095	40	.733	.024	2.674	.092
19	.430	.018	2.338	.011	41	.756	.023	2.347	.236
20	.871	.016	2.081	.098	42	.797	.046	2.582	.177
21	.759	.006	2.379	.051	43	.738	.045	2.684	.157
22	.104	.009	2.704	.015	44	.683	.032	2.553	.056

SD = Standard Deviation

TABLE 12 Average Uncompensated Own-Price Demand Elasticities

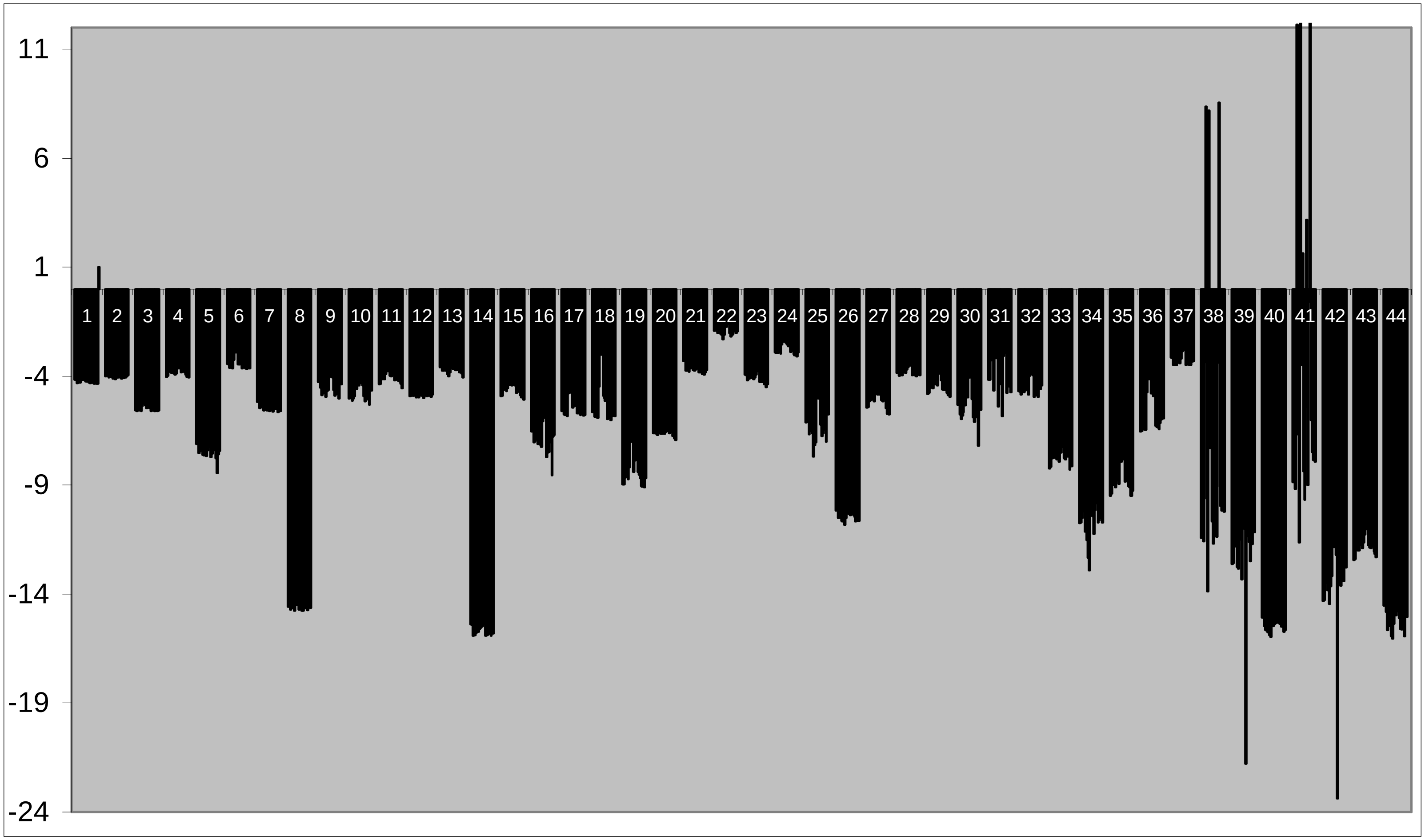
#	Product	Average	Standard Deviation
1	Dom. Apple Juice	-4.26	.07
2	OS Cranberry Juice Cocktail	-4.04	.05
3	Mott's Regular Apple Juice	-5.50	.12
4	Gatorade Lemon-Lime	-3.82	.14
5	Welch's White Grape	-7.48	.28
6	OS Ruby Red	-3.43	.27
7	Dom. Cranberry Juice	-5.49	.13
8	Musselman Apple Juice	-14.60	.11
9	OS Cranapple Drink	-4.51	.33
10	OS Cranraspberry Drink	-4.73	.33
11	Gatorade Orange	-4.09	.22
12	Hawaiian Punch	-4.90	.05
13	Gatorade Fruit Punch	-3.74	.13
14	Indian Summer Apple Juice	-15.68	.21
15	Gatorade Lemon-Ice Punch	-4.64	.22
16	Welch's Regular Grape	-6.89	.64
17	Mott's Natural Apple Juice	-5.45	.43
18	OS Ruby Red & Tangerine	-5.20	1.09
19	Treetop Apple Juice	-8.29	.70
20	Gatorade Tropical Burst	-6.61	.11
21	OS Low Calorie Cranberry	-3.71	.16
22	HI-C Fruit Punch	-1.94	.20
23	Minute Maid Apple Juice	-4.10	.22
24	OS Grapefruit Juice	-2.74	.26
25	OS Crancherry Drink	-6.18	.78
26	HI-C Orange	-10.45	.18
27	Gatorade Watermelon	-5.11	.33
28	Dom. Ruby Red Grapefruit	-3.81	.21
29	Gatorade Blue Raspberry	-4.47	.32
30	OS Crangrape Drink	-5.36	.74
31	Gatorade Grape	-3.85	.88
32	OS Low Calorie Cranraspberry	-4.56	.35
33	Dom. Cranraspberry Drink	-7.72	.38
34	Libby Punch	-10.70	.78
35	Dom. Cranapple Drink	-8.70	.60
36	OS Pink Grapefruit	-5.60	.98
37	Dom. Reg. Grapefruit	-3.22	.30
38	Gatorade Lemonade	-6.45	6.87
39	Libby Berry	-12.09	2.31
40	HI-C Ecto Cooler	-15.43	.27
41	Gatorade Brand Citrus	-3.51	7.49
42	Libby Cherry	-13.58	2.34
43	Libby Grape	-11.78	.42
44	Veryfine Apple Juice	-15.10	.51

At first-glance the own-price elasticities may appear to be larger than they ought to be; the overall average for all products and all models is –6.67 with a standard deviation of 3.76. However, when one considers the nature of the bottled juice category, the results actually seem quite reasonable. Two major characteristics contribute to the highly elastic nature of this category. First is large number of products in the category. Given so many alternatives to choose from, a change in the price of any product results in a large response from consumers. Further strengthening this result is the fact that all of these products are shelf-stable. Stock-piling, also known as inventory effects contribute heavily to the highly elastic nature of this category. It is also noteworthy that the most elastic product, along with two other highly elastic products are all different brands of apple juice: Indian Summer Apple Juice (-15.68) is the most elastic product; Veryfine Apple Juice (-15.10) is the 3rd most elastic; and Musselman Apple Juice (-14.6) is the 4th most elastic. The most inelastic product is HI-C Fruit Punch (-1.94). This is actually somewhat surprising since the two other HI-C products are highly elastic.

These two products and their respective own-price elasticities are HI-C Orange Drink (-10.45) and HI-C Ecto Cooler (-15.43). However, when one considers that HI-C Fruit Punch has only one major competitor (Hawaiian Punch), the relatively small own-price elasticity makes sense.

To get an idea of how robust the results are across models, Figure 7 provides a visual look at all of the own-price elasticities. Each block of columns contains 22 columns, one for each model. For the most part there is very little variation across

FIGURE 7
UNCOMPENSATED OWN-PRICE DEMAND ELASTICITIES FOR 44 BOTTLED JUICE PRODUCTS AND 22 DEMAND MODELS



models. However, there are some exceptions. Products 38 and 41 are a bit unstable as their own-price elasticities fluctuate from negative to positive several times. No logical reason could be established for determining why this is happening. It is interesting to note that both are Gatorade products and virtually identical in terms of all attribute information contained in the model.

The ability to come to any conclusion as to the value of the DM demand models hinges on a thorough investigation of the cross-price elasticities. As mentioned above, substitution dominates this category. Due to the massive amount of estimated elasticities only a sampling of cross-price elasticities for a group of 16 products will be presented below. The sample was constructed by selecting two products from each of the first eight flavor categories. Appendix B contains the full set of demand elasticities for one model specification (SPEC3). The choice to include this set of results was ad hoc. However, given that each specification produced roughly 20 pages of elasticity output, it seemed unwise to include a 400+ page appendix for results that were quite similar across all models[27].

Tables 13 and 14 contain the matrix of uncompensated own- and cross-price elasticities for these products. Note that the product numbers, as opposed to their names are used. The reader should refer back to Table 12 to identify the specific product names. Quickly, however, the flavor pairs are; Apple (1 & 3), Cranberry (2 & 7),

[27] Additional results will be provided by the author upon request.

TABLE 13 First Half of Uncompensated Demand Elasticity Matrix for 16 Selected Juice Products

Percent Change in the Demand for Product:	Due to a Change in the Price of Product 1	2	3	4	5	6	7	9
1	-4.26	.05	.08	.03	.03	.03	.02	.02
	-(.07)	-(.01)	-(.01)	(.00)	-(.01)	(.00)	-(.01)	(.00)
2	.05	-4.04	.04	.03	.03	.02	.03	.02
	(.00)	-(.05)	(.00)	(.00)	(.00)	-(.01)	-(.01)	(.00)
3	.11	.07	-5.50	.04	.04	.04	.04	.03
	-(.02)	(.00)	-(.12)	(.00)	-(.01)	(.00)	-(.01)	(.00)
4	.05	.05	.04	-3.82	.03	.03	.03	.03
	(.00)	(.00)	(.00)	-(.14)	(.00)	(.00)	(.00)	(.00)
5	.07	.06	.06	.04	-7.48	.04	.04	.03
	-(.02)	-(.01)	-(.02)	(.00)	-(.28)	-(.01)	-(.01)	-(.01)
6	.04	.03	.04	.03	.03	-3.43	.04	.02
	-(.01)	-(.02)	-(.01)	(.00)	-(.01)	-(.27)	-(.04)	-(.02)
7	.06	.09	.07	.04	.05	.06	-5.49	.07
	-(.02)	-(.03)	-(.02)	(.00)	-(.02)	-(.05)	-(.13)	-(.10)
9	.06	.05	.06	.04	.04	.03	.08	-4.51
	-(.01)	-(.01)	-(.01)	-(.01)	-(.01)	-(.02)	-(.11)	-(.33)
11	.06	.06	.06	.05	.04	.04	.04	.04
	-(.01)	(.00)	(.00)	-(.02)	(.00)	(.00)	(.00)	-(.01)
12	.09	.08	.08	.03	.05	.06	.05	.05
	-(.02)	-(.01)	-(.02)	-(.06)	-(.01)	-(.01)	-(.01)	-(.01)
22	.07	.07	.07	.05	.07	.07	.07	.08
	-(.02)	-(.02)	-(.02)	-(.05)	-(.02)	-(.02)	-(.01)	-(.02)
26	.09	.10	.09	.07	.08	.10	.08	.09
	-(.02)	-(.03)	-(.03)	-(.03)	-(.02)	-(.04)	-(.02)	-(.02)
28	.07	.07	.09	.07	.08	.43	.07	.11
	-(.07)	-(.12)	-(.01)	-(.02)	-(.02)	-(.16)	-(.05)	-(.04)
33	.09	.09	.14	.08	.12	.10	.05	.21
	-(.06)	-(.03)	-(.07)	-(.01)	-(.05)	-(.02)	-(.10)	-(.12)
40	.12	.12	.12	.25	.12	.14	.11	.13
	-(.05)	-(.03)	-(.04)	-(.16)	-(.04)	-(.06)	-(.03)	-(.04)
43	.22	.14	.21	.11	-.06	.15	.18	.13
	-(.13)	-(.03)	-(.14)	-(.02)	-(1.19)	-(.05)	-(.10)	-(.03)

Note: Elasticities are averages over all 22 models
Standard errors are in parentheses

TABLE 14 Second Half of Uncompensated Elasticity Matrix for 16 Selected Products

Percent Change in the Demand for Product:	Due to a Change in the Price of Product 11	12	22	26	28	33	40	43
1	.02	.02	.02	.02	.01	.01	.01	.02
	(.00)	(.01)	(.00)	(.00)	(.01)	(.01)	(.00)	(.01)
2	.02	.02	.02	.02	.01	.01	.01	.01
	(.00)	(.00)	(.00)	(.00)	(.02)	(.00)	(.00)	(.00)
3	.03	.03	.02	.02	.02	.02	.02	.02
	(.00)	(.01)	(.00)	(.00)	(.00)	(.01)	(.00)	(.01)
4	.03	.02	.02	.02	.02	.02	.05	.02
	(.01)	(.04)	(.01)	(.01)	(.00)	(.00)	(.03)	(.00)
5	.03	.03	.03	.03	.03	.03	.03	-.01
	(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.22)
6	.03	.03	.03	.03	.13	.03	.03	.03
	(.00)	(.01)	(.00)	(.01)	(.05)	(.01)	(.01)	(.01)
7	.03	.04	.03	.04	.03	.02	.03	.04
	(.00)	(.01)	(.01)	(.01)	(.02)	(.03)	(.01)	(.02)
9	.04	.04	.04	.04	.04	.07	.04	.03
	(.01)	(.01)	(.01)	(.01)	(.02)	(.04)	(.01)	(.01)
11	-4.09	.03	.03	.11	.03	.03	.03	.03
	(.22)	(.02)	(.01)	(.10)	(.00)	(.01)	(.01)	(.00)
12	.04	-4.90	.31	.06	.04	.04	.06	.05
	(.02)	(.05)	(.14)	(.03)	(.01)	(.01)	(.05)	(.02)
22	.06	.60	-1.94	.07	.07	.07	.02	.07
	(.03)	(.28)	(.20)	(.03)	(.01)	(.02)	(.13)	(.01)
26	.24	.11	.07	-10.45	.08	.08	.04	.08
	(.23)	(.07)	(.04)	(.18)	(.02)	(.02)	(.11)	(.03)
28	.07	.08	.08	.09	-3.81	.07	.08	.08
	(.01)	(.02)	(.01)	(.02)	(.21)	(.05)	(.01)	(.02)
33	.07	.09	.09	.09	.08	-7.72	.09	.13
	(.01)	(.02)	(.02)	(.03)	(.06)	(.38)	(.03)	(.07)
40	.09	.17	.03	.06	.12	.11	-15.43	0.12
	(.04)	(.15)	(.22)	(.17)	(.02)	(.03)	(.27)	(.04)
43	.10	.16	.13	.14	.13	.18	.14	-11.78
	(.02)	(.08)	(.03)	(.04)	(.03)	(.11)	(.05)	(.42)

Note: elasticities are averages over all 22 model specifications.
Standard errors are in parentheses.

Lemon (4 & 40), Grape (5 & 43), Grapefruit (6 & 28), Cranblend (9 & 33), Orange (11 & 26), and Punch (12 & 22). It is reassuring to observe that the largest cross-price elasticity for most products is the one that corresponds to the same flavored alternative. This can be said of the full set of elasticities found in the Appendix as well. Also, note that the elasticities are averages over all 22 model specification. The standard errors attest to the robustness of the estimated substitution patterns across the different models.

An even better way to see the pattern of substitution among these products is to use a bar chart like Figure 7. This gives a much clearer picture as to the patterns of substitution and variation across models. Figure 8 provides the first view of which I speak. Recalling the product numbers, note that products 3, 8, 14, 17, 19, 23, and 44 are all apple juice products. The DM model easily establishes the presence of stronger substitution between these products. Also of interest is the observation that, like the own-price elasticity results above, the cross-price elasticity estimates for this first product are quite consistent across the 22 model specifications. This result will be seen in all cross-price elasticity figures.

To get a better idea of the amount of flexibility contained in the DM demand model, Figure 9 compares the average results over all 22 DM models with those obtained from a model that was restricted as much as possible in terms of imposing structure on the cross-price coefficients. This comparison model was constructed by forcing all cross-price parameters to be the same for all products in the model. In this way, the substitution patterns, much like those that arise from a logit model, are

FIGURE 8
UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT #1 (DOMINICK'S APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

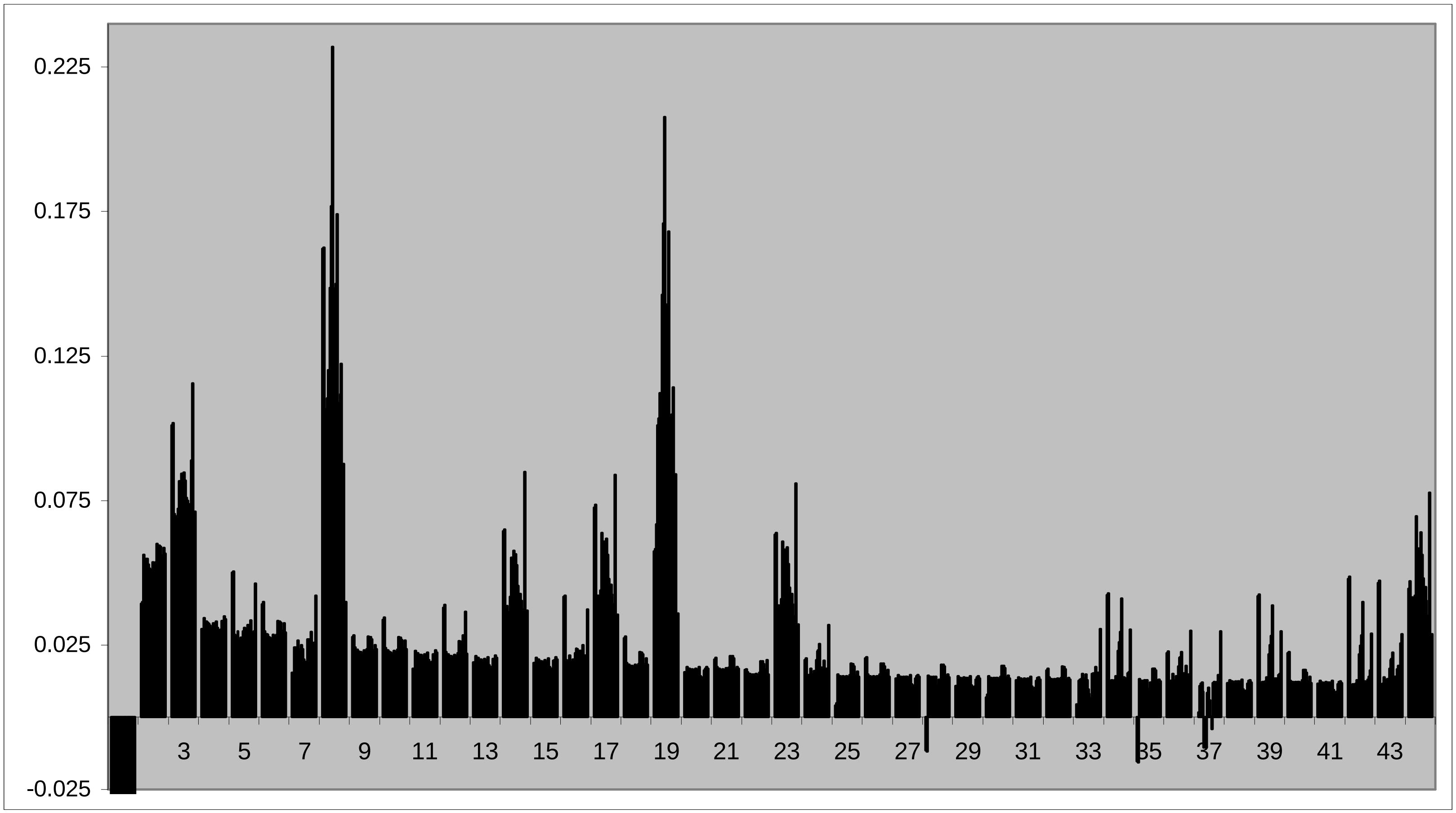
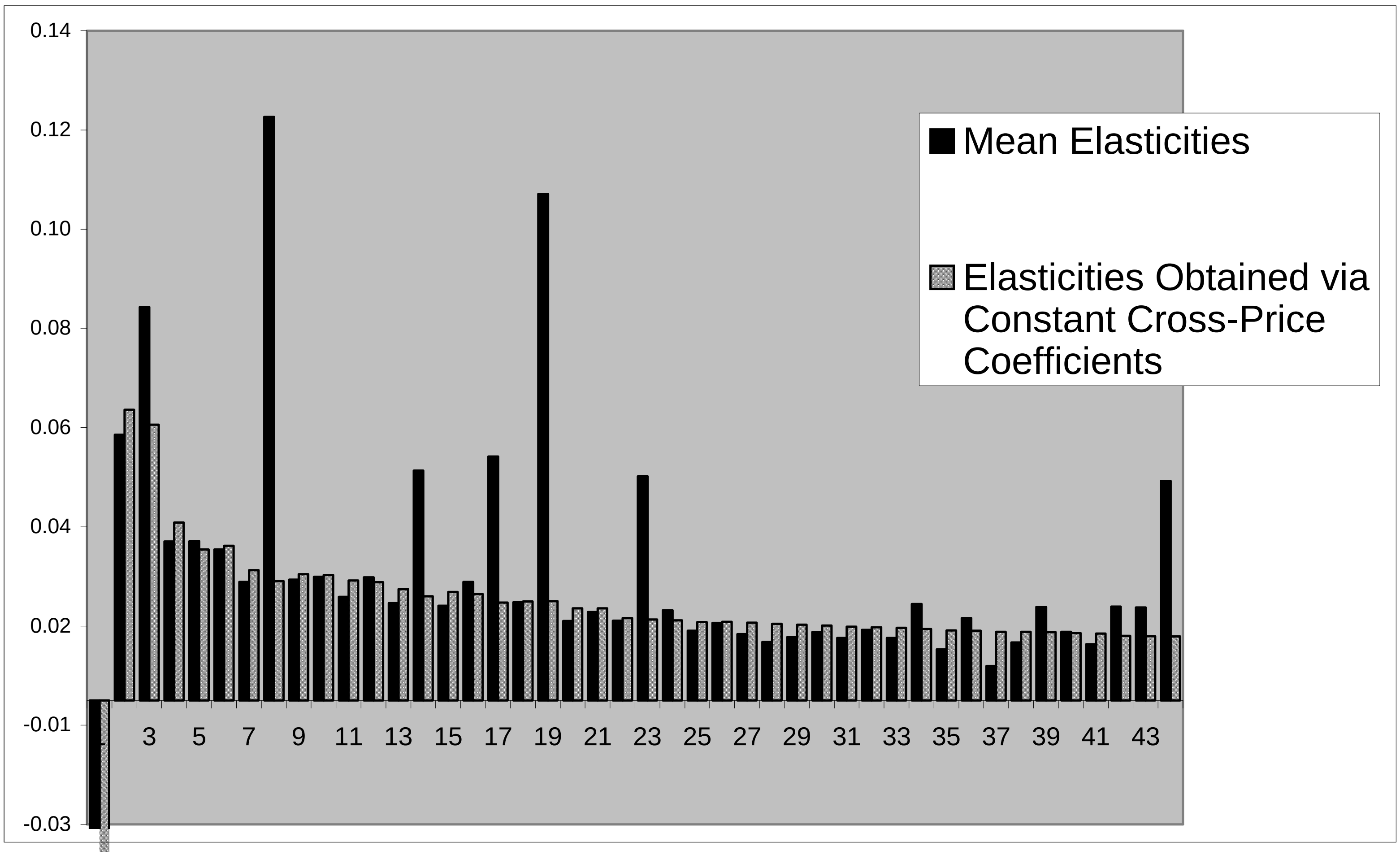


FIGURE 9
COMPARISON OF AVERAGE ELASTICITIES FOR PRODUCT #1 OVER ALL 22 MODELS WITH THOSE OBTAINED FROM A MODEL CHARACTERIZED BY CROSS-PRICE COEFFICIENTS THAT WERE CONSTANT ACROSS ALL GOODS



primarily driven by market shares (i.e. substitution strength is in proportion to the market shares). While the majority of cross-price elasticities for Dominick's Apple Juice could be said to follow this pattern, the DM model clearly demonstrates the ability to identify stronger substitution effects amongst products that are similar in more ways than just market share level.

For fear of discussing the cross-price elasticity results ad nauseam, one more, within text example will be given. Figures and Tables for all remaining products can be found in Appendix C.

Figures 10 and 11 below paint a clear picture of the substitution patterns for product number 9, Ocean Spray Cran-Apple Juice. According to these figures the strongest substitutes, in order of their mean (across all models) elasticities, are (i) Ocean Spray Cran-Cherry, (ii) Ocean Spray Cran-Raspberry, (iii) Ocean Spray Cran-Grape, (iv) Dominick's Cran-Apple, (v) Dominick's Cranberry, and (vi) Dominick's Cran-Raspberry. These results imply that consumers of Ocean Spray cranblends are brand loyal. If the price of their favorite cranblend product increases, they would rather purchase another Ocean Spray cranblend than a private label version. Granted, the Dominick's cranblend products account for a noticeable amount of substitution. However, their relative position "at the back of the train" cannot be disputed.

Another interesting observation is that two or three of the models indicate that numerous Ocean Spray cranblends are complements and not substitutes. This would certainly be good news for folks at Ocean Spray. However, the vast majority of

FIGURE 10
UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 9 (OCEAN SPRAY CRANAPPLE) OVER ALL 22 MODEL SPECIFICATIONS

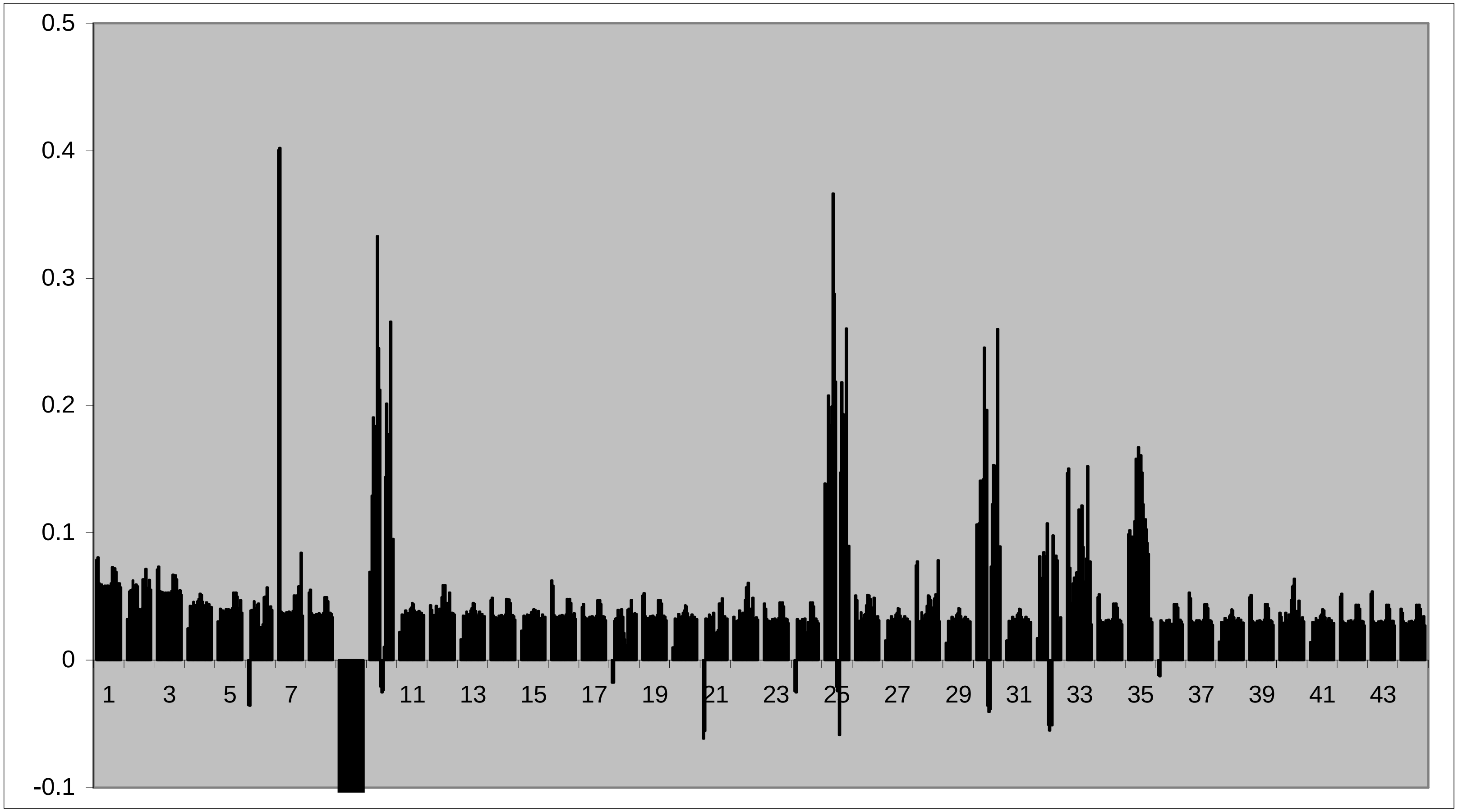
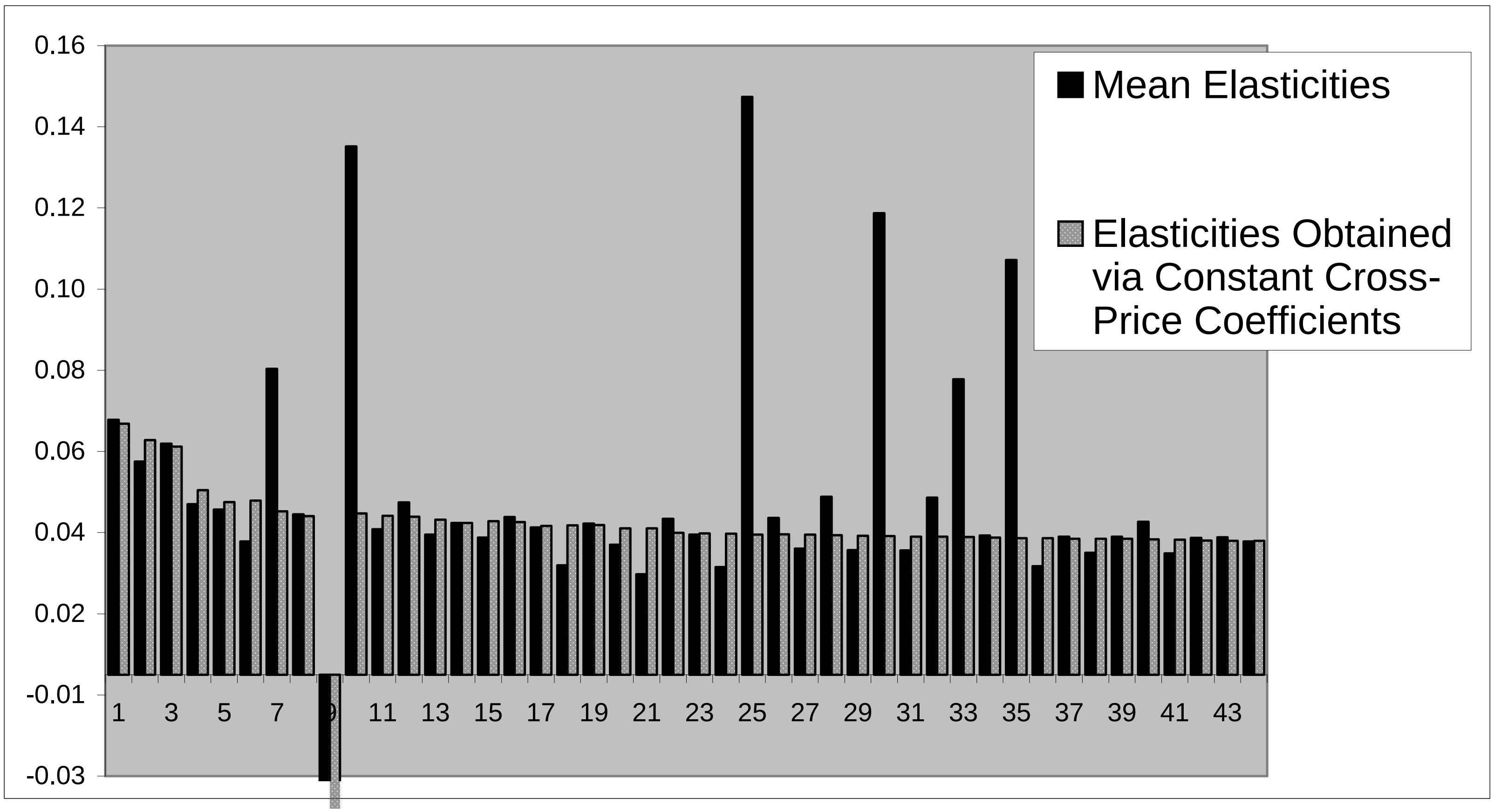


FIGURE 11
COMPARISON OF AVERAGE ELASTICITIES FOR PRODUCT #9 OVER ALL 22 MODELS WITH THOSE OBTAINED FROM A MODEL CHARACTERIZED BY CROSS-PRICE COEFFICIENTS THAT WERE CONSTANT ACROSS ALL GOODS



specifications predict brand cannibalization.

Finally, again it is noteworthy that the DM method produces reasonable conclusions regarding substitution *patterns*. One might argue that these results are predetermined by the modeler's specification of the DM function. However, this argument holds little merit when you consider that the overall theme of substitution patterns was determined just as well with the use of a single product attribute (SPEC21 and SPEC22) as with the much more complex DM functions.

Merger Simulation Results

Now that the uncompensated price elasticities have been estimated, they can be used in our supply model to obtain marginal costs and then predict the price effects of some hypothetical mergers. First recall equation (2.10) from our supply-side model above:

$$\frac{\partial \Pi^m}{\partial p_k} = w_k + \left(\frac{p_k - c_k}{p_k} \right) \varepsilon_{kk} w_k + \sum_{l \in K_m} \left(\frac{p_l - c_l}{p_l} \right) \varepsilon_{lk} w_l = 0 \qquad \forall\, k \in K_m$$

Plugging mean prices, expenditure shares, and elasticities into this system of equation we solve for the marginal costs for each manufacturer's products. Before this can be done, it first had to be determined who actually maintains ownership of each product. For some products this was trivial, for others it required some investigation. Table 15 provides a breakdown of the 44 products by ownership. At this point we only use the first 44 products. To estimate the demand model, as is typical, one demand

TABLE 15 Ownership of 44 Bottled Juice Products

OCEAN SPRAY	22.71%
2 OS Cranberry Juice Cocktail	
6 OS Ruby Red	
9 OS Cranapple Drink	
10 OS Cranraspberry Drink	
18 OS Ruby Red & Tangerine	
21 OS Low Calorie Cranberry	
24 OS Grapefruit Juice	
25 OS Crancherry Drink	
30 OS Crangrape Drink	
32 OS Low Calorie Cranraspberry	
36 OS Pink Grapefruit	
45 OS Cranstrawberry	
DOMINICK'S	13.89%
1 Dom. Apple Juice	
7 Dom. Cranberry Juice	
28 Dom. Ruby Red Grapefruit	
33 Dom. Cranraspberry Drink	
35 Dom. Cranapple Drink	
37 Dom. Reg. Grapefruit	
QUAKER OATS CO.	15.43%
4 Gatorade Lemon-Lime	
11 Gatorade Orange	
13 Gatorade Fruit Punch	
15 Gatorade Lemon-Ice Punch	
20 Gatorade Tropical Burst	
27 Gatorade Watermelon	
29 Gatorade Blue Raspberry	
31 Gatorade Grape	
38 Gatorade Lemonade	
41 Gatorade Brand Citrus	
CADBURY SCHWEPPS	8.46%
3 Mott's Regular Apple Juice	
17 Mott's Natural Apple Juice	
WELCH'S	4.76%
5 Welch's White Grape	
16 Welch's Regular Grape	
COCA-COLA	3.81%
22 HI-C Fruit Punch	
23 Minute Maid Apple Juice	
26 HI-C Orange	
40 HI-C Ecto Cooler	
NESTLE	2.64%
34 Libby Punch	
39 Libby Berry	
42 Libby Cherry	
43 Libby Grape	
INDIVIDUAL PLAYERS	
8 Musselman Apple Juice	2.45%
12 Hawaiian Punch	2.12%
14 Indian Summer Apple Juice	1.90%
19 Treetop Apple Juice	1.58%
44 Veryfine Apple Juice	0.57%

equation was dropped. Given the large number of products it did not seem critical to attempt to recover the parameters and elasticity estimates for the final product. Regarding Table 15, note that the market shares do not sum to 1. This is because these shares are with respect to the whole bottled juice category, of which the 44 products account for roughly 80 percent.

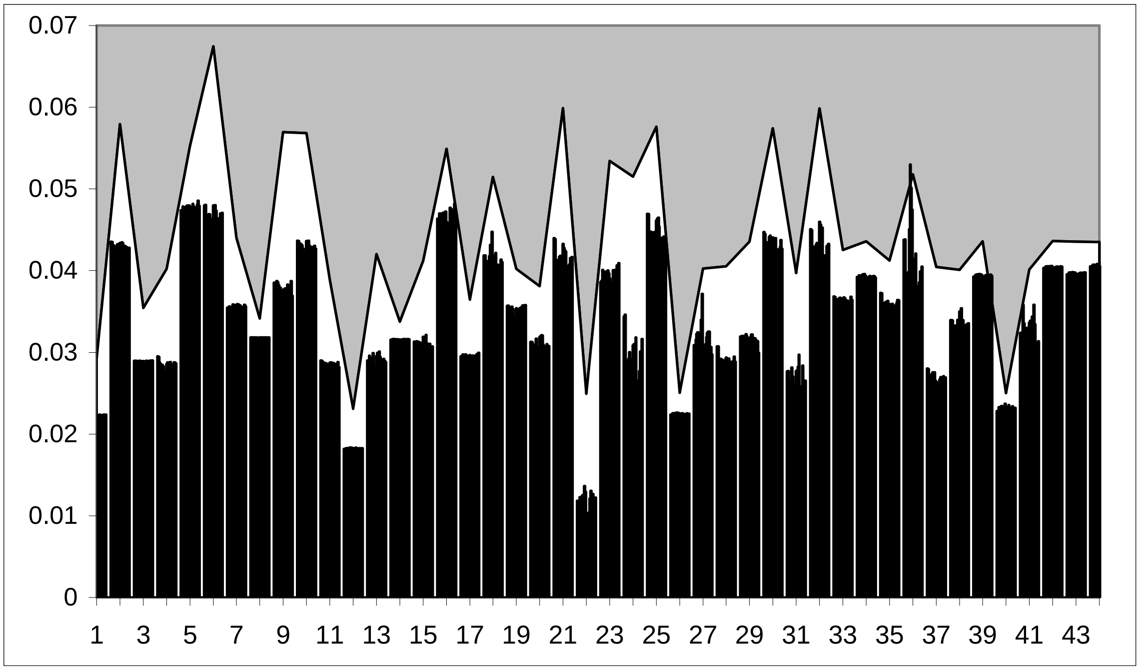
Table 16 provides a summary of the marginal cost estimates. The mean values (over all 22 specifications) are reported along with their standard errors. For comparison purposes, mean retail and wholesale prices are included as well. Since most of us do not shop for juice on a single ounce basis, prices and marginal costs are reported in terms of 64 ounce units (the most frequently purchased size).

In games of channel coordination, the only expectation regarding marginal cost estimates is that they be less than the observed retail prices. Scanning over the results in Table 16 one can see that this is the case for all products in the model. Note also that the standard deviations for the marginal costs are quite small. For example, the marginal cost estimate for a 64 ounce bottle of Treetop Apple Juice is roughly 3 pennies. The only marginal cost estimate that experiences a large amount of variation is the one for HI-C Fruit Punch. Figure 12 provides a convenient look at the variation of the marginal cost estimates over all model specifications. As with previous figures, the columns are blocked together in groups of 22. Average retail prices are plotted along the solid line that blankets the marginal costs from above. The values for each retail price are determined by the inflection points along the line. Consistent with the tables above, only a few exceptions exist in which marginal costs are higher than retail prices. Also, at first glance, it may seem strange that many of the marginal cost estimates are greater than corresponding wholesale prices. However, if the channel is in fact coordinated, it could be that wholesale prices are below cost due to some agreement whereby *all* revenues at

TABLE 16 Retail Prices, Wholesale Prices, and Estimated Marginal Costs for 44 Bottled Juice Products

		Observed Mean Prices		Marginal	Standard
#	Name	Retail	Wholesale	Cost	Deviation
1	Dom. Apple Juice	$1.87	$1.23	$1.43	0.01
2	OS Cranberry Juice Cocktail	$3.71	$2.66	$2.76	0.02
3	Mott's Regular Apple Juice	$2.27	$1.60	$1.85	0.00
4	Gatorade Lemon-Lime	$2.57	$1.87	$1.82	0.06
5	Welch's White Grape	$3.54	$2.46	$3.06	0.02
6	OS Ruby Red	$4.32	$3.09	$3.00	0.05
7	Dom. Cranberry Juice	$2.82	$1.93	$2.28	0.01
8	Musselman Apple Juice	$2.19	$1.50	$2.04	0.00
9	OS Cranapple Drink	$3.64	$2.63	$2.43	0.03
10	OS Cranraspberry Drink	$3.64	$2.61	$2.75	0.03
11	Gatorade Orange	$2.49	$1.82	$1.83	0.02
12	Hawaiian Punch	$1.48	$1.06	$1.17	0.00
13	Gatorade Fruit Punch	$2.69	$1.93	$1.87	0.04
14	Indian Summer Apple Juice	$2.16	$1.42	$2.02	0.00
15	Gatorade Lemon-Ice Punch	$2.64	$1.92	$1.99	0.03
16	Welch's Regular Grape	$3.52	$2.41	$3.00	0.04
17	Mott's Natural Apple Juice	$2.33	$1.63	$1.89	0.01
18	OS Ruby Red & Tangerine	$3.29	$2.35	$2.66	0.06
19	Treetop Apple Juice	$2.57	$1.75	$2.26	0.03
20	Gatorade Tropical Burst	$2.44	$1.80	$1.99	0.03
21	OS Low Calorie Cranberry	$3.83	$2.75	$2.67	0.07
22	HI-C Fruit Punch	$1.60	$1.12	$0.74	0.10
23	Minute Maid Apple Juice	$3.42	$2.40	$2.54	0.05
24	OS Grapefruit Juice	$3.30	$2.36	$1.88	0.17
25	OS Crancherry Drink	$3.69	$2.71	$2.87	0.07
26	HI-C Orange	$1.60	$1.13	$1.44	0.00
27	Gatorade Watermelon	$2.58	$1.85	$2.03	0.10
28	Dom. Ruby Red Grapefruit	$2.59	$1.36	$1.87	0.03
29	Gatorade Blue Raspberry	$2.79	$1.98	$2.03	0.04
30	OS Crangrape Drink	$3.67	$2.60	$2.78	0.05
31	Gatorade Grape	$2.54	$1.85	$1.72	0.07
32	OS Low Calorie Cranraspberry	$3.83	$2.84	$2.78	0.09
33	Dom. Cranraspberry Drink	$2.72	$1.79	$2.33	0.02
34	Libby Punch	$2.79	$1.97	$2.52	0.01
35	Dom. Cranapple Drink	$2.64	$1.72	$2.31	0.03
36	OS Pink Grapefruit	$3.31	$2.36	$2.67	0.26
37	Dom. Reg. Grapefruit	$2.59	$1.50	$1.72	0.04
38	Gatorade Lemonade	$2.57	$1.85	$2.12	0.12
39	Libby Berry	$2.79	$1.98	$2.52	0.01
40	HI-C Ecto Cooler	$1.60	$1.13	$1.49	0.01
41	Gatorade Brand Citrus	$2.57	$1.85	$2.07	0.12
42	Libby Cherry	$2.79	$1.98	$2.59	0.01
43	Libby Grape	$2.79	$1.98	$2.54	0.01
44	Veryfine Apple Juice	$2.79	$1.85	$2.60	0.01

FIGURE 12
MARGINAL COST ESTIMATES FOR 44 BOTTLED JUICE PRODUCTS OVER ALL 22 DEMAND MODELS



the retail level are transferred back to the manufacturer (Froeb, Tschantz, and Werden, 2005).

Assuming that marginal costs are fixed for the remainder of the exercise, we can now simulate the price-effects of any hypothetical merger. Five simulations were conducted using elasticities and marginal costs from all 22 models; (i) OceanSpray/Dominick's, (ii) OceanSpray/Welch's, (iii) OceanSpray/Libby, (iv) Gatorade/HI-C, and (v) Libby/Welch's. As with all estimates obtained thus far, the post-merger price changes will be reported as averages of the 22 models, along with their standard errors. These results can be found in Table 17 below.

The first simulation performed could be considered a "litmus test" of the merger simulation exercise. While it is difficult to conceptualize or justify a merger between the clear category leader and the store owned private label products, this merger is simulated on the basis that we know what to expect from this type of merger. As another example, in Dube's CSD merger paper, he simulated a merger between Coke and Pepsi, not because anybody believes that it will ever happen, but as a test to make sure the model makes a reasonable prediction in a case where a reasonable prediction could be made without a model. In other words, we expect to see large, positive, post-merger price changes when two category leaders merge. Thus, if the simulation exercise does not provide such results, this provides a type of indicator that something may be wrong with the model.

Simulation of a merger between Ocean Spray and Dominick's performed as expected. The new merged entity is predicted to increase the prices of most products more than 5%, the FTC "rule of thumb" for identifying mergers of concern.

As would be expected in a category characterized by a dominant pattern product substitution, only 1 out of the 64 mean post-merger price changes is negative. In the Ocean Spray / Libby merger simulation, it is predicted that the post-merger price of Libby Berry would be reduced by approximately 5 percent.

Only one post-merger price change exhibits unrealistic fluctuation over the 22 model specifications. In the Gatorade / HI-C merger, the post-merger price change for HI-C Fruit Punch is quite large (47.6%) and has a standard deviation almost twice the size of the price change (72.83%). This is likely caused by the high level of

TABLE 17 Post-Merger Price Change Simulations for the Bottled Juice Category

Ocean Spray / Dominick's Merger

#	Product	Price Change	Std. Dev.
2	OS Cranberry Juice Cocktail	1.50%	0.51%
6	OS Ruby Red	5.39%	1.61%
9	OS Cranapple Drink	4.98%	1.61%
10	OS Cranraspberry Drink	3.60%	0.82%
18	OS Ruby Red & Tangerine	5.12%	1.81%
21	OS Low Calorie Cranberry	6.17%	1.66%
24	OS Grapefruit Juice	31.22%	15.77%
25	OS Crancherry Drink	6.15%	1.64%
30	OS Crangrape Drink	8.22%	2.24%
32	OS Low Calorie Cranraspberr	9.07%	2.49%
36	OS Pink Grapefruit	11.59%	6.33%
1	Dom. Apple Juice	1.89%	0.28%
7	Dom. Cranberry Juice	4.30%	1.58%
28	Dom. Ruby Red Grapefruit	26.39%	8.67%
33	Dom. Cranraspberry Drink	9.16%	3.30%
35	Dom. Cranapple Drink	10.49%	3.94%
37	Dom. Reg. Grapefruit	59.91%	30.31%

Ocean Spray / Welch's Merger

#	Product	Price Change	Std. Dev.
2	OS Cranberry Juice Cocktail	0.23%	0.03%
6	OS Ruby Red	0.45%	0.16%
9	OS Cranapple Drink	0.53%	0.09%
10	OS Cranraspberry Drink	0.45%	0.12%
18	OS Ruby Red & Tangerine	0.70%	0.78%
21	OS Low Calorie Cranberry	0.84%	0.17%
24	OS Grapefruit Juice	2.40%	1.19%
25	OS Crancherry Drink	0.69%	0.14%
30	OS Crangrape Drink	0.87%	0.18%
32	OS Low Calorie Cranraspberr	1.10%	0.26%
36	OS Pink Grapefruit	1.14%	0.63%
5	Welch's White Grape	1.58%	0.40%
16	Welch's Regular Grape	2.93%	1.17%

Note: Std. Dev. = Standard Deviation

Ocean Spray / Dominick's Merger

#	Product	Price Change	Std. Dev.
2	OS Cranberry Juice Cocktail	0.23%	0.07%
6	OS Ruby Red	0.59%	0.33%
9	OS Cranapple Drink	0.73%	0.22%
10	OS Cranraspberry Drink	0.63%	0.27%
18	OS Ruby Red & Tangerine	0.73%	0.33%
21	OS Low Calorie Cranberry	1.22%	0.36%
24	OS Grapefruit Juice	3.91%	2.35%
25	OS Crancherry Drink	1.05%	0.33%
30	OS Crangrape Drink	1.33%	0.42%
32	OS Low Calorie Cranraspberry	1.66%	0.52%
36	OS Pink Grapefruit	1.98%	1.50%
34	Libby Punch	3.96%	1.31%
39	Libby Berry	-5.38%	1.98%
42	Libby Cherry	5.97%	1.54%
43	Libby Grape	4.68%	1.69%

Gatorade / HI-C Merger

#	Product	Price Change	Std. Dev.
4	Gatorade Lemon-Lime	0.92%	0.74%
11	Gatorade Orange	1.31%	0.55%
13	Gatorade Fruit Punch	2.96%	2.38%
15	Gatorade Lemon-Ice Punch	1.12%	0.47%
20	Gatorade Tropical Burst	1.93%	1.60%
27	Gatorade Watermelon	1.46%	1.35%
29	Gatorade Blue Raspberry	2.16%	1.52%
31	Gatorade Grape	2.84%	2.04%
38	Gatorade Lemonade	1.52%	1.24%
41	Gatorade Brand Citrus	1.87%	1.41%
22	HI-C Fruit Punch	47.6%	72.83%
26	HI-C Orange	2.26%	0.67%
24	HI-C Ecto Cooler	2.38%	1.94%

Libby / Welch's Merger

#	Product	Price Change	Std. Dev.
34	Libby Punch	0.39%	0.15%
39	Libby Berry	0.48%	0.29%
42	Libby Cherry	0.36%	0.14%
43	Libby Grape	0.56%	1.53%
5	Welch's White Grape	0.18%	0.25%
16	Welch's Regular Grape	0.47%	0.19%

variability observed in the marginal cost estimates for HI-C Fruit Punch.

As with investigation of the previous results, a clear picture of the variation in post-merger price effects across all models is in order. Figures 13-17 below provide a visual inspection of this variation. Again, each *block* of columns is constructed of 22 columns, one for each model specification. Numbers on the y-axis are the post-merger changes in retail price. Numbers positioned above or below the column blocks correspond to the products involved in the merger. Some of the figures include a solid white line (or a dotted black one). This line is drawn at the level .05 and represents the agencies' "rule-of-thumb" threshold used to identify the exertion of too much market power. Thus, if it is thought that post-merger price changes will be greater than 5%, there is a good chance that the merger will be contested.

Conclusions

Of particular value to this study is the understanding of how post-merger price changes are influenced by the numerous model specifications used. Knowing that construction of the "true" demand model is impossible, it would be of value to know how much of a difference decisions regarding specification choices can make. If it can be shown that results are robust over a wide range of model specifications, then speaking confidently about ones conclusions is much easier to justify. The goal of this paper was to explore the dimension reduction, flexibility, and "ease of use" properties of the DM demand model. Previous work in this area has been beneficial from an introductory

FIGURE 13
OCEAN SPRAY/DOMINICK'S POST-MERGER PRICE CHANGE PREDICTIONS

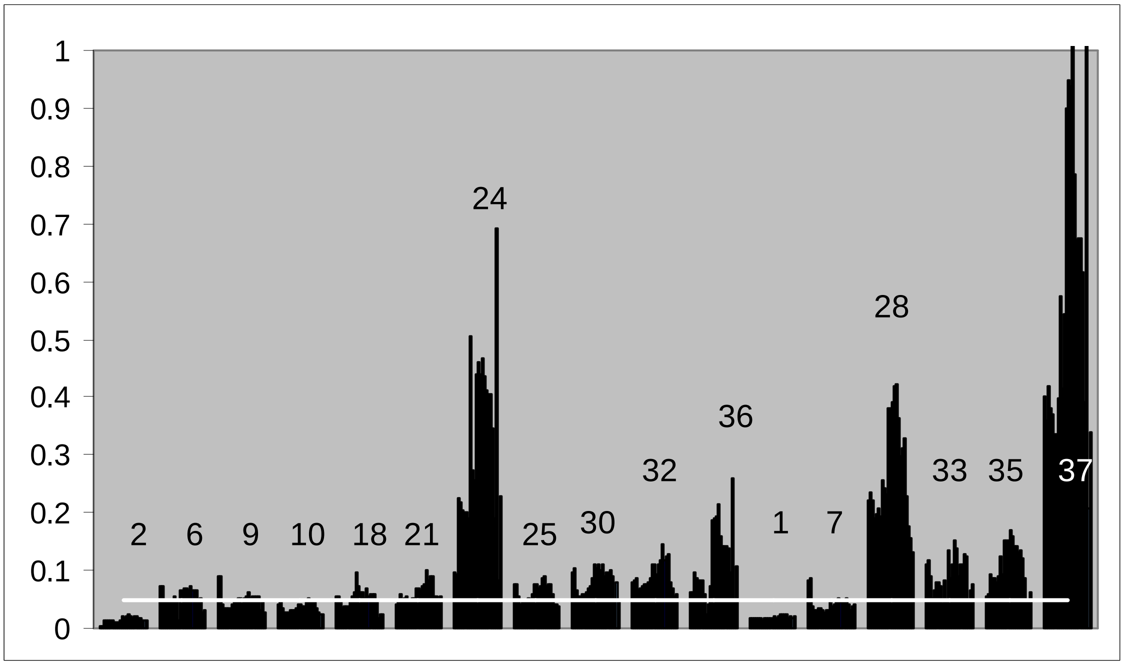


FIGURE 14
OCEAN SPRAY/WELCH'S POST-MERGER PRICE CHANGE PREDICTIONS

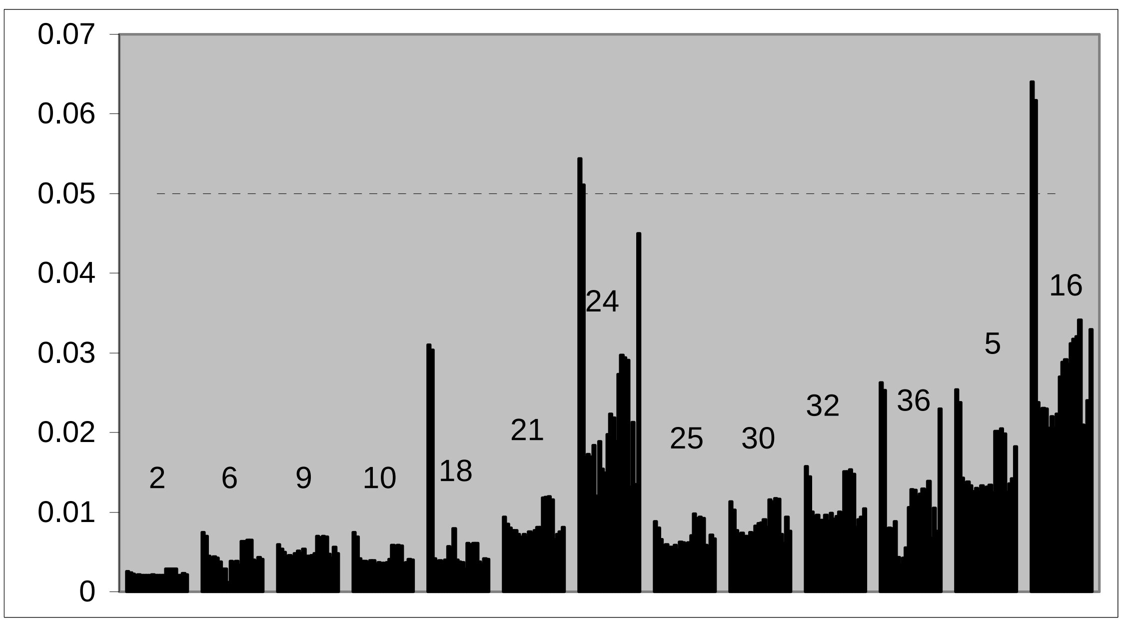


FIGURE 15
OCEAN SPRAY/LIBBY POST-MERGER PRICE CHANGE PREDICTIONS

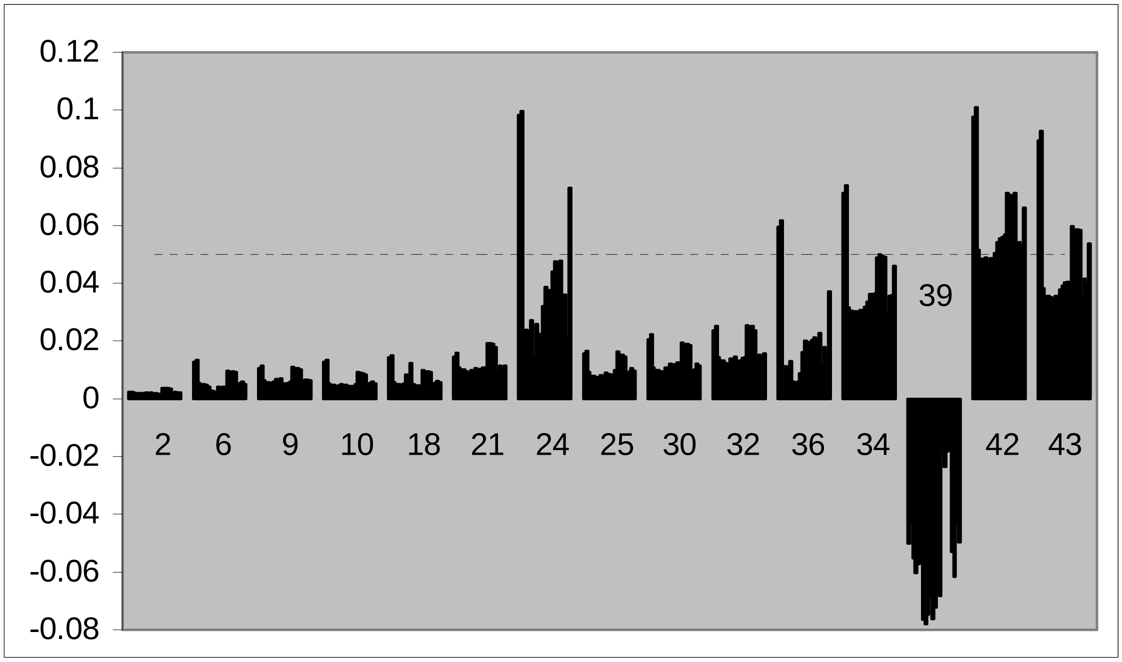


FIGURE 16
GATORADE/HI-C POST-MERGER PRICE CHANGE PREDICTIONS

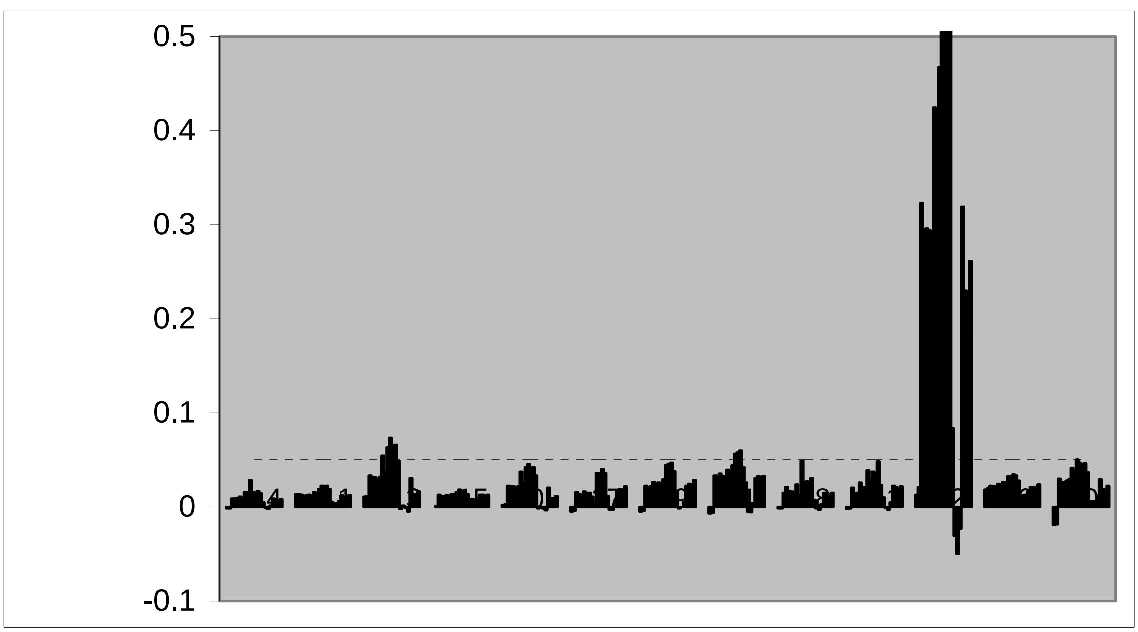
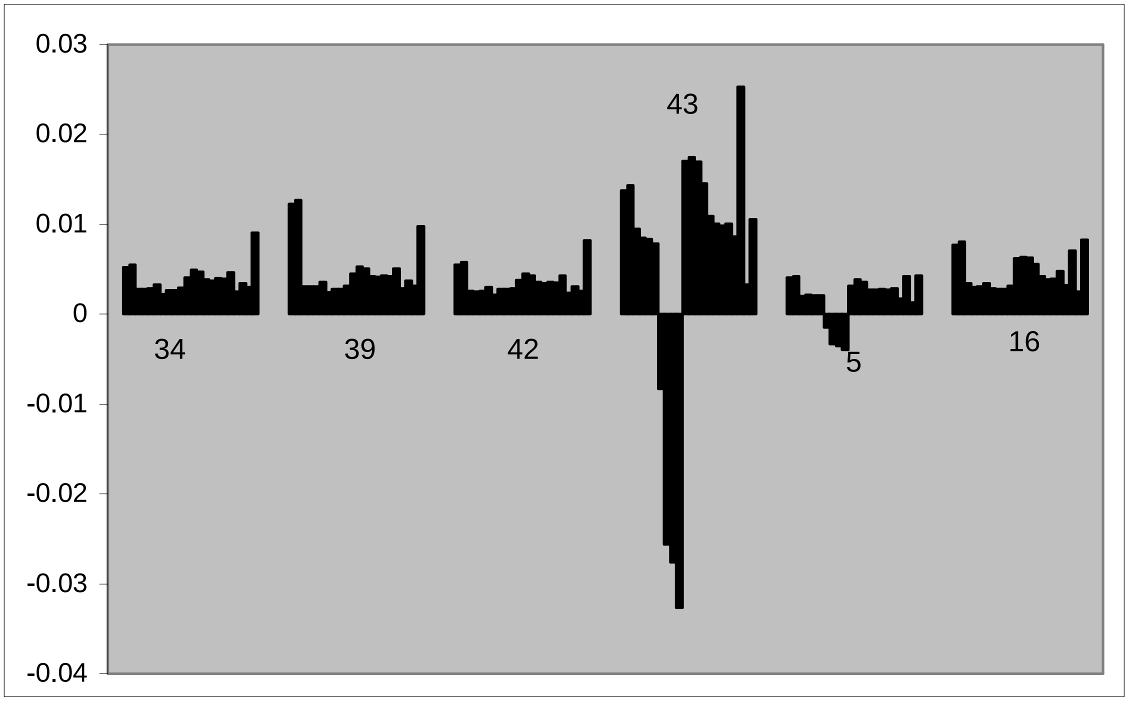


FIGURE 17
LIBBY/WELCH'S POST-MERGER PRICE CHANGE PREDICTIONS



perspective. Nevertheless, very little research has been done to validate or reject the claims of this previous research. Due to data limitations, Pinkse and Slade (2004) do not address certain questions that would be valuable to any practitioner who might wish to use their model. For example, without being able to know ahead of time, it could be quite frustrating trying to weed through an abundance of attribute data in an effort to arrive at a final model specification. Ultimately, arriving at a final specification may not even be possible unless someone simply decides to be ad hoc. The consequential question then is whether or not anyone needs to "pull-teeth" or "lose any sleep" over this process.

If specification, whether parametrically or non-parametrically, of the DM function has a major effect on model results, then some systematic or data-driven approach ought to be used to avoid spurious modeling. If, on the other hand, elasticity estimates are robust to a wide range of choices regarding the DM function, then researchers could save a lot of time and worry regarding the choice of DM structure. Whatever the case may be, these issues play a major role in arriving at any type of consensus regarding the value of the DM demand model to merger simulation practitioners.

Addressing the practical issues above, this study provides a valuable example of the variation that can be encountered over a range of DM function specifications. Twenty two specifications were used whereby estimates of demand elasticities, and simulated post-merger prices were obtained. It was shown that in the bottled juice category, a product proximity measure based on a single attribute such as juice content, was as quite capable of determining logical substitution patterns. Results over a range of more complicated specifications involving numerous discrete and continuous attribute metrics were shown to be relatively stable as compared to the simpler specifications.

This study is not complete and numerous thoughts about future research opportunities arose along the way. As pointed out previously, the demand system estimated in this paper differed significantly from Pinkse and Slade's in that the dimension reducing DM structure was only partially imposed. In this case, the DM structure reduced the dimensions enough that estimation of a system of 44 equations was achievable. If, like Pinkse and Slade, a group of 63 products were under consideration, it's quite possible that estimation of a system would be infeasible, even with the reduction in cross-price parameters. This issue begs the question of whether or not it is possible to identify dimensionality threshold levels. In other words, as more and more products are added to a demand system, eventually we will reach a point where estimation is not possible unless additional structure is imposed. Supposing that we follow the approach used in this paper and only impose structure on the cross-price parameters (obviously the biggest source of large numbers of parameters), if more products were then added to the model, at what point would we again run into degrees of freedom problems whereby more structure would need to be imposed?

An additional research possibility has to do with the attribute data used. While nutritional label information is readily available, if consumers do not pay attention to this information in their purchase decisions, then how can use of these measures be justified? It would be interesting to collect, through surveys or experiments, *perceived* attribute information and then to compare the effectiveness of these more "realistic" product attributes to model substitution patterns in contrast to the attribute information that is more easily accessible to researchers.

While many more questions exist, this paper provides a valuable contribution to a relatively new area of research. Although the results of this paper are unique to a particular product category and dataset, and cannot be generalized, they, nevertheless, are of worth in the sense that they can now become a piece of evidence in future endeavors involving the DM demand model. Finally, as many authors have stated (Hosken et al., 2002; Pinkse and van Damme, 2005) the value of a particular demand model to merger authorities and consultants is very much determined by its tractability. It has been demonstrated that in situations involving large numbers of products that possess noticeable differences in attribute space, the DM demand model is quite easy to use and has the capability of being robust across numerous specifications.

RETAIL ZONE PRICING AND SIMULATED PRICE EFFECTS OF UPSTREAM MERGERS*

Introduction

In the small, but growing, body of literature addressing horizontal merger simulation, much has been written about the variation of “back end” post-merger price changes that result from different “front end” demand specifications[28]. However, there are other components of the merger simulation process that have received very little attention. Within the context of upstream horizontal mergers, our goal is to investigate the extent to which downstream post-merger price changes are influenced by retail zone pricing[29]. To the best of our knowledge, pricing to market at the retail level has not been explored empirically in the context of simulating the effects of upstream mergers.

In the marketing literature, much recent work has focused on retail zone pricing.

---

* Reprinted with permission (permission letter is in Appendix D) from “Retail Zone Pricing and Simulated Price Effects of Upstream Mergers” by Geoffrey M. Pofahl, Oral Capps, Jr., and H. Alan Love, 2006, International Journal of the Economics of Business, Vol. 13(2), pp. 195-215. Copyright 2006 by Taylor & Francis (http://www.tandf.co.uk/Journals).

[28] For example, Werden and Froeb (1994) use a logit demand system, Hausman, Leonard, and Zona (1994) promote the use of the Almost Ideal Demand System (AIDS) model in merger simulation, Crooke et al. (1999) demonstrate the differences in estimated elasticities and post-merger price changes resulting from various demand specifications, Saha and Simon (2000) introduce the Polynomial Logit Demand model, Nevo (2000a) elaborates on the advantages of using random coefficient logit models of demand, and Capps et al. (2003) introduce the Rotterdam model to merger simulation.

[29] The marketing literature defines zone pricing as a form of third-degree price discrimination in which the retailer identifies geographic zones characterized by certain types of consumers, which it believes to have a different willingness to pay for certain, if not all, products (Chintagunta, Dube, and Singh, 2003).

It is well known that fast-food chains charge higher prices for items sold inside ballparks and airports, and gasoline chains have been found to charge higher prices at outlets near freeways (see Shepard, 1991). Several recent papers find that this form of third-degree price discrimination also is prevalent among retail grocery chains. The steady move towards zone pricing has no doubt been spurred on by increases in data availability and the research deemed possible by such data. Access to historical store level transaction data enables retail chains to realize the differences in consumer preferences and price sensitivities from store to store, allowing them to be much more fine-tuned in their pricing policies. Additionally, there have been numerous studies demonstrating the potential gains to retailers for participating in zone pricing. For instance, Kim, Blattberg, and Rossi (1995) show that optimal retail pricing should take into account variation in price sensitivities due to consumer heterogeneity. Chintagunta, Dube, and Singh (2003) find that retail price discrimination, in the long run, can damage consumer relations, thereby offsetting any short-run gains due to price dispersion. However, they also show that it is possible for retailers to establish zone pricing rules that can increase category profitability without appropriating too much surplus from their valued customers.

Witnessing this growing trend toward zone pricing, another vein of literature has sought to explain what drives such behavior. Is zone pricing motivated solely by a desire to extract surplus from consumers, a reaction to horizontal competition, a result of strategic games with manufacturers, or a mixture of all three? Studies that focus on demand-side explanations have found that consumer demographics have more power to explain retail price dispersion than variables representing horizontal competition (e.g. Besanko, Dube, and Gupta, 2003; and Chintagunta, Dube, and Singh, 2003). These findings are consistent with Slade (1995) who uses interviews with store managers to justify an assumption that retailers act as local monopolists (see Besanko, Gupta, and Jain, 1998 as well)[30].

In contrast, Sudhir (2001) and Chintagunta (2002) ignore consumer considerations in the pricing problem and focus instead on the role of manufacturer relations and horizontal competition in retail pricing rules. By simultaneously considering the vertical strategic interaction between manufacturers and a retailer as well as the manufacturer's horizontal competition, Sudhir (2001) empirically infers the pricing rule used by retailers. He finds that the pricing rule actually used is consistent with category profit maximization[31], where manufacturers move first in Stackelberg game-play with retailers. In addition, there is some evidence of tacit collusion among manufacturers in the first stage of game-play. Within the analgesics category, Chintagunta (2002) evaluates the merits of manufacturer payments to retailers, brand costs, the store's objective with respect to its private label products, and horizontal competition, in explaining retail-pricing behavior. He finds that the effects of each

---

[30] In Slade's interviews, store managers claim that consumers do not shop across stores on a product-by-product basis. Contrary to this evidence, Richards (2005) finds that in some product categories the elasticity of substitution across stores is larger than the elasticity of substitution across products, implying that competition does not allow retailers to behave as local monopolists.

[31] Using data on the two largest retailers in a market, Sudhir (2001) finds that retail prices for peanut butter products and yogurt products reflect the objective of category profit maximization as opposed to profit maximization at individual brand levels.

factor vary across brands within the category. Shankar and Bolton (2004) have produced perhaps the most complete investigation of retail pricing by recognizing that zone pricing is the result of complex issues involving the entire manufacturer-retailer-consumer vertical chain. By considering numerous variables representing horizontal competition as well as upstream relations, they show that consumer demographics and subsequent price sensitivities explain only a small portion of retailer pricing relative to these other considerations.

Although there is no consensus as to how retail price discrimination should be modeled, explained, or promoted, clearly it has been established that zone pricing does occur and at least two contributing factors are local consumer price sensitivities and vertical strategic interactions with manufacturers. Despite these recognitions, the impact of retail price dispersion has received very little attention within the context of upstream merger analysis[32]. How then are post-merger prices affected if the conventional assumption that retailers act as neutral pass-through intermediaries does not hold? The goal of this paper is to empirically explore this question.

---

[32] In an unpublished paper by Cooper et al. (2005), the effects of price-discrimination on merger analysis is discussed, but within an assumed context that is somewhat different from the one which will be presented in this paper. Most notable is their assumption of price-discrimination occurring at the same stage of the vertical channel as that in which the merger takes place. They also assume the price-discrimination is “asymmetric” in that the firms under consideration are at odds as to which consumers have high versus low willingness to pay. As will be shown, our model assumes price-discrimination by a *single* retail chain, whose zone specific stores receive uniform prices from each upstream firm under consideration. Even if we were able to consider more than one price-discriminating retailer, it is quite likely that the different retailers would be in agreement as to which zones were characterized by high versus low willingness to pay consumers. Other than the agreement that price-discrimination effects merger analysis, the differences in circumstantial assumptions make it difficult to effectively make comparisons between the study of Cooper et al. and the one presented here.

In this paper, we characterize how zone pricing might affect post-merger price changes. Zone pricing may result in dissimilar post-merger price changes and welfare effects from an upstream merger. The paper is organized as follows. First we describe the empirical setting, followed by presentation of the demand specification issues, an introduction of the pricing game and equilibrium concept used to solve for post-merger price changes, demand system estimation and the ensuing empirical results, merger simulation results, and, finally, overall conclusions.

Empirical Setting

The Data

For this study we use publicly available data from the Kilts Center for Marketing, University of Chicago. The data include weekly store level transaction prices, quantities and profit margins for over 100 stores operated by Dominick's Finer Foods. From the profit margin information we are able to infer wholesale prices. Accounting for approximately 20 percent of market share, Dominick's is the second largest supermarket chain in Chicago. We use 100 weeks of data ranging from April 1992 until March 1994.

This data set is very appropriate for the objectives of our study. Expansion of zone pricing by Dominick's has been well documented[33] , along with the contention that

---

[33] Hoch et al. (1995), Besanko, Dube, and Gupta, (2003), and Chintagunta, Dube, and Singh. (2003) all find that Dominick's zone pricing expands from only 3 distinct zones in the early years of the data (e.g., 1989-1990) to upwards of 16 price zones in 1992 and beyond.

consumer demographics have more to do with Dominick's pricing zones than horizontal competition (e.g. see Hoch et al., 1995; Besanko, Dube, and Gupta., 2003; and Chintagunta, Dube, and Singh, 2003). Because of these findings, we assume that stores within each price zone act as local monopolists, and that any observed price discrimination is the result of responding to consumer price sensitivities. Even if we wanted to include horizontal competition in our model, the ability to do so is hampered by the lack of any data on prices and quantities for retail chains other than Dominick's.

The Industry

The Ready-to-Eat Cereals (RTEC) industry is a fascinating specimen for merger simulation analysis. Producing over 200 competing products (Nevo, 2001) it is arguably the finest example of a differentiated products industry in the realm of food marketing. Also, the RTEC industry constitutes one of the top five revenue-generating categories in the dry goods grocery industry (Dube, 2004), is second only to automobile manufacturers in television advertising expenditures (Nevo, 1997), and has had its fair share of contested merger proposals in its history (for a summary of merger activity and industry history see Nevo, 2000a).

Demand estimation and merger simulations are conducted using ten aggregate RTEC products. We form Kids, Family, and Adult groupings for the top three producers in the industry, Kellogg's, General Mills, and Post[34]. The final product grouping is an

[34] The aggregate groupings were motivated by Hausman's (1994) RTEC study in which he uses a multi-stage budgeting framework and divides 20 products in weakly separable categories, Kids, Family, and Adult.

aggregate of the Ralston Chex line of cereals. The Chex brand is of interest since it was approved for acquisition by General Mills in December 1996 (for a more complete history of this merger see Nevo, 2000a). In Table 18, we provide a list of these product groupings as well as the specific products they contain. The selection rule for the full list of products was that each product must posses a market share of at least 1/3 of a percent[35]. This resulted in the aggregation of 63 products to create the 10 used in this study. These 63 products account for approximately 77% of all breakfast cereal sales for the period of interest.

Along with the price and quantity data for each RTEC product, we also have the zip code information for the store in which it was sold. Using 1990 U.S. Census information for each zip code area, we are able to divide the data into subsets of stores that sell to a more narrowly defined customer base. Although it has been documented that Dominick's has up to 16 separate price zones throughout the Chicago area, we assume, for simplicity, the use of only two price zones. The two price zones are defined

[35] In such a highly differentiated industry, new product introduction is considered quite successful if it can achieve ½% of market share (Cotterill, 1999).

TABLE 18 Breakdown of 10 Aggregate Ready-To-Eat Cereal Products

Number	Aggregate Product	Disaggregate Products Within Group
1	KELLOGGS KIDS	Frosted Flakes, Fruit Loops, Apple Jacks, Cocoa Krispies, Corn Pops, Honey Smacks
2	GEN. MILLS KIDS	Golden Grahams, Cinnamon Toast Crunch, Trix, Lucky Charms, Kix, Cocoa Puffs, Count Chocola
3	POST KIDS	Alphabits, Honey Combs, Cocoa Pebbles, Sugar Crisp, Fruity Pebbles, Marshmallow Alphabits
4	KELLOGGS FAMILY	Rice Krispies, Corn Flakes, Raisin Bran, Bite Size Miniwheats, Raisin Squares, Strawberry Miniwheats, Sugar Frosted Miniwheats, Apple Cinnamon Miniwheats, Frosted Miniwheats
5	GEN. MILLS FAMILY	Cheerios, Honey Nut Cheerios, Wheaties, Total Raisin Bran, Apple Cinnamon Cheerios, Clusters, Raisin Nut Bran, Oatmeal Raisin Crisp
6	POST FAMILY	Natural Raisin Bran, Raisin Bran, Honey Bunches of Oats, Honey Bunches of Oats with Raisins
7	KELLOGGS ADULT	Special K, Product 19, Crispix, All Bran, Cracklin Oat Bran, Just Right Fruit, Nutri-Grain Almond Raisin, Nutri-Grain Raisin Bran, Nutri-Grain Almond, Bran Flakes, Nut and Honey, Fruitful
8	GEN. MILLS ADULT	Whole Grain Total, Total Corn Flakes, Fiber One, Oatmeal Crisp
9	POST ADULT	Grape Nuts, Natural Bran Flakes, Fruit and Fiber
10	RALSTON CHEX	Wheat Chex, Corn Chex, Rice Chex

along lines of household income[36]. Stores that reside in zip codes characterized by

[36] Although other demographic variables could be important in explaining price-sensitivity and substitution patterns we focus on income for (1) simplicity and (2) its relative importance as compared to

median household incomes greater than $100,000 define our first price zone. The stores that fall into zone two are those that face a consumer base whose median family income is less than $48,000[37]. In Table 19, we provide a breakdown of zip code income demographics as well as stores located within each zip code.

In summary, we have two data sets for RTEC products sold in Chicago: one contains weighted average price (wholesale and retail) and quantity information for all Dominick's stores in Chicago; the second contains the same information but divides it into the two price zones defined above. Exhibited in Table 20 is a comparison of weighted average prices for each price zone as compared to averages across all of Chicago. Weighted average prices and quantities for the two data sets are used to estimate price-elasticities and post-merger price effects for two retail-pricing scenarios.

---

the effects of other demographics on store-level elasticities. Hoch et al. (1995) found that education level, which is highly correlated with income, has a relatively large effect on the level of price elasticities.

[37] This decision is arbitrary but we feel that it is sufficient to demonstrate the objectives of this paper.

TABLE 19 Zip Codes, Select Demographics, and the Number of Dominick's Stores Within Each Price Zone

Zip Code	Population	Median Family Income	% of Households Below Poverty	Store Numbers	Price Zone
60093	19,528	162,607	1.3	1	1
60305	11,635	122,155	2.5	1	1
60521	37,496	114,584	3	1	1
60015	27,224	113,663	1.5	1	1
60558	12,539	108,867	0.7	1	1
60047	38,168	107,105	2	1	1
60062	40,392	106,020	1.3	1	1
60540	42,065	100,789	1.5	2	1
60160	23,034	47,200	8.5	1	2
60153	26,863	47,135	11.1	1	2
60409	39,065	46,071	9.7	1	2
60629	113,984	44,965	12.1	1	2
60618	98,147	44,566	11.7	2	2
60625	91,351	43,729	13.5	1	2
60620	85,771	41,449	16.3	1	2
60632	87,577	40,935	13.1	1	2
60660	47,726	40,863	14.8	1	2
60617	96,288	39,604	17.3	1	2
60640	74,030	37,766	20.3	1	2
60649	54,823	31,228	23.3	1	2

Source: U.S. Census Bureau, Summary File 1 (SF 1) and Summary File 3 (SF 3), 2000

TABLE 20 Pre-Merger Weighted Average Retail Prices

Product	All Chicago	Zone 1	Zone 2
Kellogg's Kids	$.21	$.21	$.21
General Mills Kids	$.24	$.25	$.25
Post Kids	$.24	$.24	$.24
Kellogg's Family	$.17	$.18	$.17
General Mills Family	$.21	$.21	$.21
Post Family	$.18	$.19	$.18
Kellogg's Adult	$.22	$.22	$.22
General Mills Adult	$.24	$.24	$.25
Post Adult	$.16	$.16	$.22
Ralston Chex	$.21	$.21	$.22

Demand Model

Price or merger simulations are dependent upon the choice and estimation of a demand system. Capps, Church, and Love (2003) stipulate that a demand system for use in merger simulations must possess two characteristics: (1) for each brand, the cross-price elasticities of the demand system are estimated from the data; and (2) the elasticities are not constant, but vary as prices change, typically rising as price increases (Crooke et al., 1999). Importantly, demand system analysis also allows for imposition of restrictions derived from consumer demand theory (typically symmetry and homogeneity).

The Almost Ideal Demand System (AIDS) (Deaton and Muellbauer, 1980a) has been used for litigation purposes, and this demand system choice is well documented in the literature (Hausman and Leonard, 1997; Werden, 1997). In this section, we follow Hausman, Leonard, and Zona (1994) as well as Capps, Church, and Love (2003) and others who have used the AIDS specification.

LA/AIDS

Let w_i denote the expenditure share of brand *i*, where $w_i = (p_i q_i)/X$, p_i is the price of brand *i*, q_i the quantity of brand *i* demanded, and X is total expenditure on the group of brands. The AIDS specification when there are *N* brands is

$$w_i = \alpha_i + \sum_{j=1}^{N} \gamma_{ij} \ln(p_j) + \beta_i \ln(X / P^*), \tag{3.1}$$

where P^* is a price index defined as

$$\ln(P^*) = \alpha_0 + \sum_j \alpha_j \ln(p_j) + (0.5)\sum_j \sum_i \gamma_{ij} \ln(p_i)\ln(p_j) .$$

The restrictions on the parameters of the AIDS demand system implied by demand theory are, for the adding-up constraint $\sum_{i=1}^{N}\alpha_i = 1, \sum_{i=1}^{N}\beta_i = 0,$ and $\sum_{i=1}^{N}\gamma_{ij} = 0;$ for homogeneity $\sum_{j=1}^{N}\gamma_{ij} = 0;$ and for symmetry $\gamma_{ij} = \gamma_{ji}$.

The non-linear nature of P^* means that in practice when an AIDS system is estimated, Stone's index (*P*) is used instead where $\ln(P) = \sum_i w_i \ln(p_i)$. When *P* is used instead of P^* the estimated demand system is known as the "linear approximate AIDS" or LA/AIDS model. While the use of *P* simplifies estimation of the demand system, it is problematic from a theoretical perspective since the expenditure share equations that comprise (1) are no longer a reduced form. Substituting in *P* for P^* (3.1) becomes

$$w_i = \alpha_i + \sum_{j=1}^{N}\gamma_{ij} \ln(p_j) + \beta_i \ln(X) - \beta_i \ln\left(\sum_j w_j \ln(p_j)\right), \tag{3.2}$$

which is a system of *N* equations in *N* unknowns. Capps, Church, and Love (2003) derived the reduced-form expenditure shares given by

$$w_i = \frac{x_i(1+\sum_{j\neq i}^{N}\beta_j \ln(p_j)) - \beta_i(\sum_{j\neq i}^{N} x_j \ln(p_j))}{1+\sum_{i=1}^{N}\beta_i \ln(p_i)}, \tag{3.3}$$

where x_i is

$$x_i = \alpha_i + \sum_{j=1}^{N} \gamma_{ij} \ln(p_j) + \beta_i \ln(X). \tag{3.4}$$

The use of Stone's index means that there are a number of possible alternative formulas for the uncompensated own- and cross-price elasticities. The issue of the "correct" elasticity to use when the LA/AIDS model is estimated has been considered in Green and Alston (1990), Alston, Fost, and Green (1994), and Buse (1994). The AIDS elasticities are

$$\varepsilon_{ij}^{AIDS} = -\delta_{ij} + (\gamma_{ij} / w_i) - (\beta_i / w_i)\left(\alpha_j + \sum_{k=1}^{N} \gamma_{kj} \ln(p_k)\right). \tag{3.5}$$

where δ_{ij} is the Kronecker delta equal to 1 when $i = j$ and 0 otherwise. The common approximation is method (iii) in Green and Alston (1990). When this approximation is employed, the respective elasticities are given by:

$$\varepsilon_{ij}^{AIDS} = -\delta_{ij} + \frac{\gamma_{ij} - \beta_i w_j}{w_i}. \tag{3.6}$$

We adopt equation (3.6) to derive the own- and cross-price elasticities in our analysis. Because demand is a function of total expenditure on the group of brands, it is important to note that the elasticity formulas are conditional on total expenditure. That is, we estimate conditional own- and cross-price elasticities in lieu of unconditional elasticities. It is possible to derive the set of unconditional elasticities (see Hausman, Leonard, and Zona,1994; Edgerton, 1997). However, due to data limitations, we could not pursue this research direction.

Equilibrium Concepts and Price Simulations

Standard protocol for the second stage of merger simulation is well established. The nature of competition over differentiated products is typically assumed to be Bertrand, and marginal costs are assumed fixed throughout the simulations. It also is assumed that retailers act as neutral uniform pricing pass-through intermediaries. When the merging firms are upstream manufacturers, the common, though possibly unrealistic, assumption employed is that manufacturers and retailers act as a vertically integrated entity in arriving at optimal retail prices (e.g. see Hausman, Leonard, and Zona., 1994; Nevo, 2000a; Capps, Church, and Love, 2003). For the purposes of this paper we will maintain the assumption of channel coordination but relax the assumption of uniform pricing by the retailer[38].

Retailer/Manufacturer Coordination and Zone Pricing

In the case of zone pricing by the retailer, the profit function for the i^{th} firm is given by:

$$\Pi_i^c = \sum_{j=1}^{J} \sum_{z=1}^{Z} (p_j^z - \lambda_j) q_j^z (P^z), \tag{3.7}$$

where j is the number of differentiated products, the superscript z indexes the number of

[38] We realize that the assumption of channel coordination is a strong one. Thus, our only justification for this assumption is that it is consistent with past merger simulation papers involving RTEC (e.g. Nevo, 2000a). Other papers have found evidence of a Stackelberg relationship between manufacturers and retailers with wholesale prices being chosen first (see Sudhir, 2001, as well as Cotterill and Putsis, 2001). We are currently working on a paper that relaxes this assumption and models the vertical channel as a two-stage pricing game.

retail price zones, p_j^z is the price of good *j* in zone *z*, λ_j is the marginal cost of product *j*, q_j^z is the quantity of good *j* sold in zone *z* and is in turn a function of P^z, the vector of all zone-specific prices for the products of interest. This specification includes two important assumptions: (1) marginal costs are equal across pricing zones[39]; and (2) no substitutability exists among goods sold in separate price zones.

Transforming the first-order conditions to be in terms of elasticities and expenditure shares we get the following expression:

$$\left(\frac{p_j^z - \lambda_j}{p_j^z}\right)\varepsilon_{jj}^z w_j^z + \sum_{k \neq j}\left(\frac{p_k^z - \lambda_k}{p_k^z}\right)\varepsilon_{kj}^z w_k^z = -w_j^z \quad \forall\ j = 1,\ldots,J \text{ and } \forall\ z = 1,\ldots,Z \quad (3.8)$$

where ε_{jj}^z is the own-price elasticity of good *j* sold in zone *z*, ε_{kj}^z is the zone-specific cross-price elasticity between products *k* and *j*, and the *w's* are expenditure shares for each product in each zone. By including price zone considerations, we have effectively increased the number of first-order conditions by a multiple of *Z*. For example, in the case of two products and two price zones, profit maximization results in four first-order conditions instead of the two that would result from uniform pricing. To arrive at estimates for pre-merger marginal costs we simply plug in mean prices,

[39] We recognize that this assumption is unlikely to hold in reality. While it may be safe to assume that manufacturing marginal costs are not a function of the zone in which the product is sold, the marginal cost of retailing could vary substantially from zone to zone. Kaufman et al. (1997) show, for instance, that there is quite a bit of variability between costs per unit sold by inner-city retail outlets versus stores located in suburbs. However, since the goal of this paper is to explore whether or not zone-pricing and vertical game-play affect post-merger price changes, we felt strongly about fixing the marginal cost so that any variation in post-merger price effects could not be attributed to variability of costs.

expenditure shares, and estimated price elasticities from our demand estimation and solve for the *Z* unknowns. The assumption of constant marginal costs across price zones creates a problem in that we are trying to solve $J \times Z$ equations for only *Z* unknowns. To get around this situation, we set up the initial problem as if we are not considering zone-pricing behavior (see Capps, Church, and Love, 2003; Hausman, Leonard, and Zona, 1994); using city- or chain-wide average prices and elasticities, we solve *J* first order conditions for *J* unknown marginal costs.

Let $s_k^z = w_k^z L_k^z$ be the product of the Lerner index of product *k* in price zone *z* and the zone level expenditure share of product *k*, E define the block diagonal matrix

$$E = \begin{bmatrix} E_1 & & 0 \\ & \ddots & \\ 0 & & E_m \end{bmatrix}, \tag{3.9}$$

with blocks $E_i = (K_i \times Z_i) \times (K_i \times Z_i)$ being themselves block diagonal matrices with $K_i \times Z_i$ blocks containing $K_i \times K_i$ own- and cross-price elasticities for the products of firm *i*, and *s* be the vector of (weighted) shares for each product-zone combination. Then the pre-merger equilibrium is defined by the following system of equations:

$$E's = -w. \tag{3.10}$$

The post-merger elasticity matrix E^M differs from *E* by the deletion of the diagonal blocks for the two merging firms (*i* and *j*) and the addition of a new diagonal block of dimension $((K_i \times Z_i) + (K_j \times Z_j)) \times ((K_i \times Z_i) + (K_j \times Z_j))$ for the merged entity. The post-merger equilibrium is defined by

$$E^{M'} s^{M} = -w^{M} . \tag{3.11}$$

To calculate the post-merger price changes we substitute into (3.11) pre-merger marginal costs, the own- and cross-price elasticities, and expenditure shares, then solve numerically for post-merger prices.

The simulation exercise requires identifying which observations correspond to the pre-merger equilibrium. The use of mean values for price and quantity, while natural in many applications, may not be appropriate if they are not representative of the recent industry experience. As Werden (1997) observes, the theoretically correct benchmark parallels what would prevail in the absence of the merger. Usually this benchmark is a recent time period, but it should be long enough to average out transitory/seasonal effects. For this study, mean prices and expenditure shares were calculated using the most recent 52 weeks of data.

Demand System Estimation and Empirical Results

Estimation of the LA/AIDS demand system may raise concerns regarding identification due to the fact that prices are explanatory variables. However, we assume that prices are not endogenous, but are set by retailers prior to consumers making their purchasing decisions. This assumption is consistent with the nature of scanner data (Capps, 1989).

We report the empirical results associated with the estimation of the LA/AIDS using Zellner's iterative seemingly unrelated regression procedure (ITSUR). The software package used was TSP, version 4.5. The breakfast cereal omitted from the direct estimation of the demand system so as to avoid the singularity of the variance-covariance matrix of disturbance terms was Ralston Chex.

Parameter estimates and associated p-values for the LA/AIDS model are exhibited in Appendix-D in Table D-1. Recall that we employ three versions of the LA/AIDS demand system: (1) all Chicago; (2) low-income areas of Chicago; and (3) high-income areas of Chicago. Most of the parameter estimates are statistically different from zero at the 0.05 level. Information pertaining to goodness-of-fit and serial correlation in conjunction with estimation of the LA/AIDS model is given in Table 21.

TABLE 21 Goodness of Fit and Serial Correlation Diagnostics for the LA/AIDS Model for Breakfast Cereal

	All Chicago		Zone 1		Zone 2	
Equation	R-Squared	Durbin-Watson	R-Squared	Durbin-Watson	R-Squared	Durbin-Watson
KELLOGGS KIDS	.58	1.72	.58	1.71	.60	1.78
GEN. MILLS KIDS	.34	1.87	.29	1.91	.43	1.82
POST KIDS	.15	2.34	.17	2.31	.23	2.36
KELLOGGS FAMILY	.29	2.20	.29	2.15	.31	2.31
GEN. MILLS FAMILY	.18	2.30	.16	2.26	.23	2.20
POST FAMILY	.19	2.13	.19	2.15	.21	2.18
KELLOGGS ADULT	.53	1.62	.48	1.65	.56	1.61
GEN. MILLS ADULT	.09	2.30	.09	2.27	.16	2.32
POST ADULT	.48	1.90	.48	1.84	.52	1.83

The price simulations depend upon the uncompensated own- and cross-price elasticities derived from the estimated system. These elasticities and their p-values are found in Table 22.

In all cases, the own-price elasticities are negative, elastic, and statistically significant. Importantly, the own-price elasticities are greater (in absolute value) for the low-income sample relative to the high-income sample. The own-price elasticities for General Mills Adult cereals are smallest in magnitude (-2.35, -2.46, and –2.12 respectively), and the own-price elasticities for Kellogg’s Kids cereals are largest in magnitude (-5.58, -5.46, and –5.27 respectively). The elastic demands for cereals in this analysis may be attributed to the number of available alternatives as well as the weekly time frame. The greater the number of potential substitutes, the greater the magnitude of the own-price elasticities. Also, the use of weekly data allows for potential inventory effects, which in turn subsequently raises the price sensitivity.

With regard to cross-price elasticities, across all three samples, most (roughly 85 percent) are positive in sign, indicative of substitutes. None of the negative cross-price elasticities, indicative of complements, is statistically significant at the 0.05 level. Approximately 25 percent of the positive cross-price elasticities are statistically significant at the 0.05 level. Simply put then, substitutability among cereal types and brands rather than complementarity is the dominant behavior in the LA/AIDS model.

TABLE 22 LA/AIDS Uncompensated Elasticities for Ready-To-Eat Cereal for All Chicago, Zone1, and Zone2

	All Chicago		Zone 1		Zone 2	
Elasticity	Estimate	P-value	Estimate	P-value	Estimate	P-value
E11	-5.58	[.000]	-5.27	[.000]	-5.46	[.000]
E12	.46	[.080]	.32	[.247]	.51	[.014]
E13	.57	[.010]	.48	[.018]	.57	[.002]
E14	1.37	[.000]	1.36	[.000]	1.42	[.000]
E15	.69	[.030]	.36	[.302]	.74	[.005]
E16	.53	[.007]	.69	[.003]	.45	[.005]
E17	.47	[.015]	.41	[.102]	.41	[.003]
E18	.13	[.442]	.19	[.328]	.08	[.506]
E19	.13	[.072]	.13	[.189]	.12	[.005]
E10	.12	[.556]	.18	[.418]	.09	[.515]
E21	.53	[.047]	.32	[.182]	.83	[.005]
E22	-3.10	[.000]	-2.96	[.000]	-3.57	[.000]
E23	-.12	[.551]	-.02	[.910]	-.05	[.812]
E24	1.01	[.000]	.89	[.001]	1.11	[.000]
E25	.94	[.002]	1.05	[.000]	.92	[.003]
E26	-.04	[.860]	.01	[.957]	-.02	[.909]
E27	.11	[.577]	.02	[.922]	.15	[.428]
E28	.05	[.772]	-.04	[.808]	.18	[.306]
E29	.02	[.822]	-.01	[.905]	-.01	[.830]
E20	-.13	[.487]	-.08	[.671]	-.16	[.378]
E31	1.63	[.007]	1.41	[.014]	1.94	[.001]
E32	-.33	[.549]	-.06	[.911]	-.13	[.795]
E33	-4.32	[.000]	-3.98	[.000]	-4.95	[.000]
E34	.86	[.228]	.98	[.151]	.96	[.152]
E35	.75	[.236]	.28	[.664]	.88	[.120]
E36	-.22	[.637]	-.61	[.243]	.02	[.956]
E37	.33	[.397]	.45	[.349]	.23	[.479]
E38	.15	[.673]	.21	[.591]	.06	[.829]
E39	.11	[.468]	.21	[.355]	.10	[.331]
E30	.27	[.515]	.30	[.489]	.16	[.624]
E41	.81	[.000]	.66	[.000]	1.10	[.000]
E42	.50	[.006]	.43	[.007]	.50	[.007]
E43	.15	[.382]	.15	[.252]	.19	[.300]
E44	-3.14	[.000]	-3.16	[.000]	-3.23	[.000]
E45	.05	[.849]	.26	[.284]	-.18	[.494]
E46	-.07	[.630]	.03	[.825]	-.12	[.405]
E47	-.02	[.878]	.00	[.995]	-.10	[.331]
E48	-.05	[.647]	.00	[.987]	-.08	[.430]
E49	.07	[.096]	.11	[.038]	.03	[.317]
E40	-.17	[.225]	-.20	[.151]	-.10	[.381]

TABLE 22 Continued

	All Chicago		Zone 1		Zone 2	
Elasticity	Estimate	P-value	Estimate	P-value	Estimate	P-value
E51	.529	[.017]	.220	[.216]	.840	[.002]
E52	.632	[.003]	.626	[.000]	.646	[.004]
E53	.190	[.245]	.049	[.674]	.280	[.117]
E54	.269	[.308]	.428	[.063]	.064	[.831]
E55	-2.988	[.000]	-2.696	[.000]	-3.251	[.000]
E56	.117	[.452]	.064	[.641]	.186	[.279]
E57	.191	[.194]	.234	[.089]	.275	[.069]
E58	.051	[.713]	.011	[.926]	.075	[.618]
E59	.020	[.748]	.071	[.264]	.013	[.811]
E50	.176	[.230]	.146	[.254]	.177	[.209]
E61	1.736	[.004]	1.637	[.002]	2.069	[.003]
E62	-.105	[.867]	.026	[.963]	-.092	[.886]
E63	-.245	[.640]	-.494	[.241]	.028	[.960]
E64	-.067	[.915]	.314	[.605]	-.341	[.628]
E65	.546	[.428]	.286	[.638]	.793	[.286]
E66	-3.857	[.000]	-3.920	[.000]	-4.522	[.000]
E67	.190	[.732]	.392	[.443]	.228	[.687]
E68	.316	[.485]	.343	[.384]	.337	[.482]
E69	.441	[.109]	.289	[.296]	.436	[.061]
E60	.341	[.421]	.265	[.487]	.276	[.526]
E71	.681	[.004]	.412	[.041]	.889	[.001]
E72	.178	[.455]	.066	[.755]	.209	[.371]
E73	.167	[.341]	.143	[.303]	.145	[.424]
E74	.272	[.182]	.259	[.178]	.112	[.596]
E75	.417	[.102]	.453	[.036]	.541	[.045]
E76	.088	[.687]	.157	[.387]	.109	[.643]
E77	-2.644	[.000]	-2.282	[.000]	-2.788	[.000]
E78	.056	[.750]	-.001	[.995]	.095	[.613]
E79	.238	[.023]	.271	[.006]	.153	[.095]
E70	.143	[.360]	.052	[.696]	.091	[.568]
E81	.387	[.387]	.445	[.288]	.345	[.391]
E82	.126	[.794]	-.115	[.800]	.392	[.316]
E83	.142	[.682]	.153	[.597]	.066	[.821]
E84	.010	[.982]	.182	[.676]	-.027	[.944]
E85	.193	[.718]	.040	[.934]	.241	[.611]
E86	.267	[.496]	.315	[.387]	.251	[.475]
E87	.075	[.848]	-.056	[.886]	.145	[.664]
E88	-2.353	[.000]	-2.118	[.000]	-2.463	[.000]
E89	.095	[.574]	.024	[.894]	.176	[.157]
E80	.218	[.492]	.258	[.382]	.197	[.446]

TABLE 22 Continued

	All Chicago		Zone 1		Zone 2	
Elasticity	Estimate	P-value	Estimate	P-value	Estimate	P-value
E91	.661	[.030]	.430	[.104]	1.001	[.001]
E92	.123	[.711]	.010	[.975]	-.035	[.905]
E93	.201	[.421]	.212	[.323]	.243	[.293]
E94	.795	[.006]	.831	[.002]	.599	[.025]
E95	.211	[.585]	.461	[.168]	.141	[.710]
E96	.636	[.101]	.360	[.272]	.722	[.056]
E97	.858	[.023]	.908	[.006]	.600	[.095]
E98	.178	[.517]	.052	[.823]	.405	[.143]
E99	-4.422	[.000]	-4.102	[.000]	-4.338	[.000]
E90	.377	[.068]	.383	[.032]	.242	[.219]
E101	.570	[.515]	.576	[.388]	.795	[.459]
E102	-.594	[.482]	-.290	[.650]	-.877	[.377]
E103	.445	[.517]	.315	[.498]	.391	[.620]
E104	-.941	[.326]	-1.009	[.221]	-.630	[.553]
E105	1.142	[.224]	.859	[.261]	1.381	[.204]
E106	.488	[.425]	.350	[.494]	.499	[.521]
E107	.478	[.402]	.127	[.803]	.368	[.591]
E108	.365	[.488]	.370	[.386]	.481	[.444]
E109	.372	[.078]	.413	[.041]	.260	[.231]
E1010	-3.119	[.000]	-2.652	[.000]	-3.297	[.000]

Note: Eij = percentage change in demand for product i due to a 1% change in the price of product j (e.g. E90 = cross-price elasticity of product 9 with respect to product 10 - see Table 18 for product number key)

Key substitutes among the cereals in question in all three samples are the following: (1) Kellogg's Kids with Post Kids; (2) Kellogg's Kids with Kellogg's Family; (3) Kellogg's Kids with Post Family; (4) General Mills Kids with Kellogg's Family; and (5) General Mills Kids with General Mill Family. As exhibited in Table 23, the most common form of substitutability among brands is Kids cereals with Family cereals, followed by Kids cereal with Kids cereals, Kids cereals with Adult cereals, and Family cereals with Adult cereals. Only a few significant cross-price elasticities are evident which support the substitutability among Adult cereal products. No significant cross-

TABLE 23 Number of Statistically Significant Substitution Relationships Among Types of Cereals*

Form of Substitutability	All Chicago	Low Income	High Income
Kids with Kids	3	4	2
Family with Family	0	0	0
Adult with Adult	2	0	1
Kids with Family	10	10	8
Kids with Adult	3	4	1
Family with Adult	1	2	3

* Significant at the 0.05 level

price elasticities exist which support the substitutability of Family cereal products. Consequently, among Family cereals and to a lesser degree Adult cereals, brand loyalty is evident in the Chicago area.

Merger Simulation Results

Post-merger price effects were estimated for the following two scenarios: (1) channel coordination with no retail zone pricing (the conventional case) and (2) channel coordination with retail zone pricing. For each scenario we construct 21 mergers involving the 10 aggregate products defined previously. In turn, post merger price changes are computed for products produced by the merging entities[40]. None of the hypothetical scenarios consists of the complete merging of one manufacturer with another. Given that the RTEC industry already is highly concentrated, we felt that this level of acquisition would be extremely unlikely to occur in reality. If mergers or acquisitions were to take place, most likely they would consist of one manufacturer purchasing a line of products from another manufacturer (for examples of other merger simulations in the RTEC industry see Nevo, 2000a). Thus, each of the 21 mergers we simulate consists of one manufacturer, say Post, acquiring one line of another manufacturer's products, say General Mills Kids cereal.

Post-merger price changes for scenarios (1) and (2) can be found in Table 24. As can be seen, positive post-merger price changes dominate the results. This result is directly attributable to the prevalence of strong substitution relationships among the goods under consideration. For the case of no retail zone pricing (scenario 1), 66 of the 84 post-merger price changes are positive; 40 of these are greater than 5%. The post-merger price changes range from a low of –21.6% to a high of 50.1%. While many of the price changes are positive and large, there are several merger scenarios in which negative post-merger price changes could potentially "offset" the effects of the positive changes. For example, when Post purchases the Kellogg's Family line, it is estimated

[40] Post merger price changes are not calculated for products of non-merging firms. This is because we are assuming that price elasticities and expenditure shares are fixed throughout the merger simulation, which implies that our results are approximations of the exact solutions (see Capps, Church, and Love, 2003, for a discussion of approximate versus exact solutions).

TABLE 24 **Post-Merger Price Changes for Scenarios (1) and (2)***

Merger or Acquisition	Product	% Change in Prices: All Chicago	Zone 1	Zone 2	Merger or Acquisition	Product	% Change in Prices: All Chicago	Zone 1	Zone2
Kellogg's	K KIDS	14.19%	10.09%	15.38%	General Mills	GM KIDS	.18%	.66%	.34%
and	K FAMILY	32.71%	21.41%	34.95%	and	GM FAMILY	2.80%	1.79%	3.28%
General Mills	K ADULT	8.66%	2.73%	9.11%	Post	GM ADULT	5.32%	13.90%	-.27%
Kids	GM KIDS	19.26%	1.29%	24.13%	Family	P FAMILY	12.59%	13.82%	12.23%
Kellogg's	K KIDS	10.88%	11.06%	10.37%	General Mills	GM KIDS	-2.47%	-1.38%	-2.66%
and	K FAMILY	10.35%	9.17%	12.25%	and	GM FAMILY	5.38%	6.40%	4.33%
Post	K ADULT	8.01%	8.68%	6.06%	Ralston	GM ADULT	7.06%	19.67%	1.17%
Kids	POST KIDS	50.06%	70.89%	41.35%	Chex	R CHEX	41.98%	58.55%	42.22%
Kellogg's	K KIDS	13.55%	12.02%	13.07%	General Mills	GM KIDS	6.98%	7.45%	6.16%
and	K FAMILY	12.60%	18.76%	7.59%	and	GM FAMILY	8.53%	14.23%	9.13%
General Mills	K ADULT	15.36%	22.30%	18.91%	Kellogg's	GM ADULT	2.30%	2.95%	.52%
Family	GM FAMILY	1.21%	3.41%	2.87%	Adult	K ADULT	2.45%	8.21%	9.99%
Kellogg's	K KIDS	7.04%	13.22%	4.91%	General Mills	GM KIDS	.63%	.73%	-.17%
and	K FAMILY	2.20%	5.67%	1.02%	and	GM FAMILY	.64%	2.05%	.19%
Post	K ADULT	3.96%	8.85%	3.55%	Post Adult	GM ADULT	-.90%	4.09%	-3.09%
Family	POST FAMILY	22.17%	50.20%	14.30%		POST ADULT	-2.11%	2.29%	-.17%
Kellogg's	K KIDS	.87%	1.17%	.80%	Post	POST KIDS	13.34%	11.60%	14.34%
and	K FAMILY	-1.81%	-2.42%	-.73%	and	POST FAMILY	18.58%	16.21%	19.56%
Ralston	K ADULT	2.94%	1.10%	1.92%	Kellogg's	POST ADULT	7.79%	5.24%	12.04%
Chex	R CHEX	-3.74%	-10.59%	-.50%	Kids	K KIDS	-7.68%	-8.30%	-8.36%
Kellogg's	K KIDS	2.03%	3.78%	1.49%	Post	POST KIDS	-2.95%	-.78%	-.82%
and	K FAMILY	.84%	2.32%	.58%	and	POST FAMILY	-.97%	.42%	-.66%
General Mills	K ADULT	1.61%	-.30%	2.58%	General Mills	POST ADULT	.46%	-.43%	-.70%
Adult	GM ADULT	-5.51%	18.81%	-15.98%	Kids	GM KIDS	-21.61%	-25.08%	-18.36%

TABLE 24 Continued

Merger or Acquisition	Product	% Change in Prices: All Chicago	Zone 1	Zone 2
Kellogg's and Post Adult	K KIDS	3.04%	4.19%	2.28%
	K FAMILY	4.29%	5.91%	2.77%
	K ADULT	8.02%	12.89%	4.34%
	POST ADULT	23.46%	33.71%	17.14%
General and Kellogg's Kids	GM KIDS	12.60%	7.19%	16.10%
	GM FAMILY	11.71%	5.41%	16.49%
	GM ADULT	6.29%	14.12%	1.91%
	KELLOGGS KIDS	-5.40%	-9.24%	-4.40%
General and Post Kids	GM KIDS	-1.28%	-.11%	.03%
	GM FAMILY	3.50%	1.14%	4.06%
	GM ADULT	.77%	7.58%	-5.23%
	POST KIDS	12.91%	11.39%	9.87%
General Mills and Kellogg's Family	GM KIDS	25.11%	35.63%	15.02%
	GM FAMILY	5.52%	16.30%	-1.48%
	GM ADULT	-8.38%	3.02%	-13.38%
	K FAMILY	-4.95%	4.84%	-12.70%

K = Kellogg's
GM = General Mills
R = Ralston
* Scenarios: (1) = uniform pricing; (2) = zone-pricing

Merger or Acquisition	Product	% Change in Prices: All Chicago	Zone 1	Zone2
Post/K Family	POST KIDS	7.32%	10.51%	6.35%
	POST FAMILY	-3.58%	1.00%	-5.25%
	POST ADULT	5.31%	8.02%	2.36%
	K FAMILY	-12.84%	-9.65%	-16.28%
Post/GM Family	POST KIDS	8.70%	3.32%	8.73%
	POST FAMILY	7.21%	4.00%	9.54%
	POST ADULT	2.82%	5.80%	3.06%
	GM FAMILY	-11.46%	-16.07%	-7.83%
Post/R Chex	POST KIDS	3.62%	4.61%	1.73%
	POST FAMILY	6.25%	4.56%	3.76%
	POST ADULT	6.43%	7.19%	3.86%
	R CHEX	22.76%	24.45%	15.33%
Post/K Adult	POST KIDS	5.21%	8.87%	2.85%
	POST FAMILY	4.83%	8.78%	4.05%
	POST ADULT	14.24%	20.47%	9.24%
	K ADULT	-1.37%	7.00%	-2.67%
Post/GM Adult	POST KIDS	1.97%	2.85%	.95%
	POST FAMILY	6.02%	6.39%	5.65%
	POST ADULT	3.36%	1.24%	7.30%
	GM ADULT	.19%	18.04%	-8.45%

that prices for Post Kids and Post Adult will increase by 7.32% and 5.31% respectively. However, the simulated price changes for the other two relevant goods, Post Family, and Kellogg's Family, are –3.58% and –12.84% respectively. Assuming that the "5% rule" is used to determine which potential acquisitions are challenged, 17 of the 21 merger scenarios would qualify for contestability.

When price discrimination is factored in (scenario 2), the post-merger price changes are somewhat different. While the overall pattern of positive post-merger price changes still prevails, it is clear that the merger implications for separate price zones are quite different for many of the simulations considered. The most dominant result is that post-merger price changes tend to be more positive for the higher-income zone as opposed to the lower-income zone. More specifically, 71% of the post-merger price changes are such that Zone 1 consumers face either larger price increases or lower price reductions than consumers in Zone 2. Moreover, 8 of the hypothetical merger simulations produce results characterized by opposite price changes for the two zones. For example, in the Post/GM Adult merger, the price of GM Adult is predicted to decrease by 8.45% for Zone 2 consumers, whereas Zone 1 consumers face a price increase of 18%. Overall, the 21 proposed mergers result in 72 positive post-merger price changes for Zone 1 versus 61 positive price changes for Zone 2. Of the positive price changes for Zone 1, 46 are greater than 5%. For Zone 2, 32 of the positive price changes are greater than 5%.

Simply put, accounting for price discrimination can expose potentially damaging mergers that may otherwise be considered of little interest in terms of consumer protection. For example, without considering retail zone pricing, the acquisition of GM Adult by Kellogg's could possibly be overlooked as a scenario of little concern in terms of its resulting price effects. In contrast, when zone pricing is considered, it is discovered that consumers residing in Zone 1 are faced with a 19% increase in the price of GM Adult. Thus, even though the average consumer does not appear to be significantly affected by such a merger, in reality there is a group of consumers who face the possibility of a large price increase with respect to one of the aggregate products.

Conclusions

Though acknowledged and explored in other settings, retail price discrimination has yet to make a strong presence in merger simulation analysis. Our goal was to present a "tip of the iceberg" type analysis by bringing these issues to the surface of merger simulation research. By considering a small divergence from the conventional methods used in merger simulation, we were able to demonstrate the possible variations in post-merger price effects. We showed that, given certain assumptions about retail price discrimination, high-income price zones are more significantly affected by post-merger price increases than low-income price zones. We also showed that ignoring retail price discrimination, in effect, veils a potentially complex and diverse set of price effects that are otherwise lost by averaging across all price zones.

There are numerous ways that this analysis could be extended. Perhaps the most obvious next step would be to calculate welfare effects for each price zone. Although post-merger price increases were usually larger for Zone 1, it is not necessarily the case that consumers within this zone would be affected more in terms of welfare losses. Relative to their incomes, the higher post-merger prices may not be that consequential. Another interesting extension would be to relax the assumption of channel coordination and consider the effects of other types of vertical channel game-play on post-merger price effects[41]. Several studies have acknowledged that consideration of vertical channel relations could lead to a more thorough understanding of how upstream mergers affect downstream prices (e.g. Hosken et al., 2002; Werden, Froeb, and Scheffman, 2004; Froeb, Hosken, and Pappalardo, 2004; Villas-Boas, 2004). However, to date very few papers have shed light on this issue. O'Brien and Shaffer (forthcoming) and Milliou and Petrakis (2005) explore theoretical aspects of these vertical relations, but focus more on nonlinear pricing, bargaining, and product bundling, as opposed to the nature of the vertical game being played, e.g. vertical integration (the standard approach) versus a Stackelberg price leadership game. A recent paper by Froeb et al. (2005) has begun to investigate the potential effects of vertical games on merger simulations. Their analysis suggests that careful consideration of vertical restraints between manufacturers and retailers is important in assessing the likely effects of mergers of manufacturers selling differentiated products through retailers.

A final shortcoming of our study is our inability to consider the pricing behavior of other retailers in the area. Given additional data on other retail chains, it would be

[41] We had originally planned to include this extension in this analysis. However, we have had some difficulty in achieving reasonable solutions, although we currently are working to alleviate this problem.

quite interesting to investigate the effects of upstream mergers selling through more than one price discriminating retailer, where the price discrimination is symmetric in nature (see endnote 5. for a description of symmetric price discrimination). Cooper et al. (2005) indicate that when price discrimination is symmetric, the resulting welfare effects are difficult to characterize since they depend on horizontal competition with rivals, as well as properties of the demand specification chosen for analysis.

The value, if any, of all merger simulations depends on the degree to which underlying model assumptions are consistent with actual behavior in the industry. While the trade-off between model realism and computational burden is well recognized, it, nevertheless, appears that merger simulation is “young” enough to have much feasible evolution ahead of it. As such, consideration of behavior such as retail price discrimination is a step in the right direction.

SUPPLY CHANNEL STAGE-GAMES AND HORIZONTAL MERGER SIMULATION

Introduction/Background

The goal of accurately modeling the implications of an upstream horizontal merger along the vertical supply-channel is a lofty one indeed. The process involves numerous assumptions about the interaction of market players, any of which, if wrong, could grossly misrepresent the realities of an actual merger. Consider the following example list of questions, upon which numerous model assumptions are based:

(v) How should retail demand be modeled?

(vi) Do retailers set uniform prices or engage in price discrimination?

(vii) How should the supply-channel be modeled, i.e. Channel Coordination (CC) vs. Manufacturer Stackelberg[42] (MS) vs. Retailer Stackelberg (RS)?

(viii) Over what variables do the channel players compete, i.e. prices (Bertrand) vs. quantities (Cournot) [43]?

Since the starting point of all merger simulations is the researchers choice of a demand model, it is no surprise that the vast majority of pertinent literature has focused

---

[42] Manufactuer Stackelberg (MS) is defined as in Choi (1991). In this scenario manufacturers lead the strategic interaction by setting wholesale prices. The retailers then follow by setting retail prices.

[43] Due to the nature of differentiated product categories, the assumption of Bertrand competition (or competition over prices) is standard in merger simulation literature.

on the implications regarding this choice (see e.g. Werden and Froeb, 1994; Crooke et al., 1999; Saha and Simon, 2000; Nevo, 2000a; Hosken et al., 2002; Capps, Church, and Love, (2003); Pinkse and Slade (2004)). Question (ii) above has begun to receive some attention in a piece by Pofahl, Capps, and Love (2006), where the relative ease of integrating non-uniform retail pricing behavior into a merger simulation model is demonstrated. O'Brien and Shaffer (forthcoming) and Milliou and Petrakis (2005) address (iv) by questioning, all together, the use of constructs such as Bertrand or Cournot competition to accurately represent the interactions of manufacturers and retailers. Instead they appeal to the use of contract theory to explore alternative forms of interaction between the channel players.

Somewhat of a surprise is the lack of attention regarding question (iii). It's not that the issue has been completely overlooked. Leaving the standard assumption of Bertrand competition in tact, it has been acknowledged that the way in which this competition plays out within the supply-channel could have major implications for merger simulation results (Hosken et al., 2002; Froeb, Hosken, and Pappalardo, 2004; Villas-Boas, 2004). For example, the standard assumption in virtually all papers involving merger simulation is that manufacturers sell their differentiated products directly to final consumers. In some product categories this assumption may not be problematic. However, a large subset of merger simulation research involves products that are first sold to a channel intermediary, such as a supermarket, before being sold to final consumers. For example, merger simulations have been conducted in product categories such as beer (Hausman, Leonard, and Zona, 1994), bread (Saha and Simon, 2000), ready-to-eat cereal (Nevo, 2000a), spaghetti sauce (Capps, Church, and Love, 2003), and carbonated soft drinks (Dube, 2005). Despite the possibility that retailers and manufacturers do not behave as a vertically integrated structure, these studies, nevertheless, assume that the channel is, in fact, coordinated.

Although, as mentioned, it is well recognized that leaving the relative simplicity of coordinated channels could not only be more consistent with reality, but also have significant impacts on results, this issue is yet to be addressed in published literature. The objective of this paper is to investigate the effects of an alternative assumption about channel interactions on the simulation of post-merger price changes. It will be assumed the vertical strategic interaction (VSI) is characterized by a two-stage game in which manufacturers play the role of first-movers in setting wholesale prices, and retailers act as followers in setting retail prices (i.e. Manufacturer-Stackelberg).

It should be noted that the goal of this research changed somewhat as it progressed. The initial idea was to present a simple comparison of post-merger price changes from a model that assumed channel coordination with one that assumed a vertical structure characterized by Manufacturer-Stackelberg game-play. However, as the research progressed it became apparent that making the transition from a model of channel coordination to one involving a two-stage game was not an easy one. Given that the first set of results from the Manufacturer-Stackelberg model were unrealistically high, it became important to investigate the individual components of the model to determine what elements had the most influence on results. Much of this investigation centers on the estimation of retail pass-through rates (i.e. the change in retail price or product *i* with respect to a change in the wholesale price of product *j*). As it turns out, the need to understand how various demand specification assumptions effects merger simulations, while clearly important in the literature thus far, is intensified by the complexity of a two-stage channel game. The "modified" goal, then, is to draw attention to potential "trouble" issues that may arise, and need further research, in conducting merger simulations involving two-stage games.

The motivation and justification for this research stems from the institutional reality of the package foods industry. In an industry characterized by competing manufacturers selling to downstream retailers, it would come as no surprise to find out that interactions between these players are not coordinated, i.e. that perhaps one end of the channel (or one player in one end) had the ability to act as a leader in setting prices, while all others were forced to follow. There is much evidence in the marketing literature that this possibility is quite real. For example, evidence of Manufacturer-Stackelberg pricing has been found in several supermarket categories, such as, yogurt and peanut butter (Sudhir, 2001), ketchup (Besanko, Dube, and Gupta, 2003; and Villas-Boas and Zhao, 2005), pasta (Cotterill and Putsis, 2001), and instant coffee (Cotterill and Putsis, 2001).

An abundance of studies exist in the marketing literature in which modeling of the strategic interactions between upstream manufacturers and downstream retailers are a key component. However, most of these studies are attempting to infer what type of market behavior is consistent with the observable data they possess. For example, Kadiyali, Chintagunta, and Vilcassim (2000) use an assumed demand model along with parameterized supply-side equations which are then estimated simultaneously to obtain optimal pricing rules and to infer which, if any, market players possess pricing power. Cotterill and Putsis (2001) conduct a similar study but use what could be regarded as a "menu" approach to determining which assumptions regarding demand form, supply structure, and pricing rules best fit the data. More explicitly, given three demand specification alternatives, two forms of vertical interaction (Manufacturer Stackelberg and Vertical Nash[44]), and two types of retail markup behavior (proportional markups or nonproportional markups), Cotterill and Putsis (2001) analyze all combinations of these components and determine which formulation best fits the data. In 2001, Sudhir "ups the ante" by adding inference of interactions between manufacturers to the mix. Analyzing the yogurt and peanut butter categories, he simultaneously determines that the best fitting model for these categories is characterized by 1) category profit maximizing pricing by retailers (as opposed to brand profit maximizing pricing), 2) Manufacturer Stackelberg game-play between manufacturers and retailer, and 3) tacitly collusive pricing interactions between the upstream manufacturers. Finally, Villas-Boas and Zhao (2005) conduct a study that is almost identical to Sudhir's, but apply their model to the Ketchup market of Midland, Texas.

The common theme in the papers above is the inference of competitive or anti-competitive behavior along the vertical channel. While the goal of this paper is not to identify the channel structure, the "channel-identification" literature is important to this

---

[44] As opposed to the MS model where manufacturers are leaders in setting prices and retailers are followers, the VN model assumes that neither end of the supply channel has the ability to be a price leader. Thus, manufacturers and retailers make their pricing decisions simultaneously.

study in that it provides an excellent outline of how to model various channel structures, an obviously important component of this paper.

A vein of literature more closely related to the objectives of this paper includes those that assume a channel structure and then use this assumption to address “other “ issues. For example, Besanko, Gupta, and Jain (1998) assume Vertical Nash interactions between manufacturers and retailers and use the corresponding price response functions to account for price endogeneity in their demand estimation. In other words, their paper is not concerned with the identification of channel structure: it is concerned with measuring the demand estimation bias that can occur when price endogeneity is not accounted for. Similarly, Besanko, Dube, and Gupta (2003) use the Manufacturer Stackelberg construct to explore various opportunities for price discriminating behavior among channel players. Again, while the selection of a vertical game in these papers was not ad hoc (they used intuition to guide their choice), the focus of these papers was not to infer the true nature of the supply channel.

In similar fashion, to restate, the goal of this paper is not to identify the nature of interactions between manufacturers and a retailer, but to simply explore how two assumptions regarding this interaction (channel coordination vs. Manufacturer Stackelberg) can affect the impending results. The remainder of the paper will proceed as follows. The modeling details are outlined first, followed by a discussion of data and results, and overall conclusions.

The Model

Demand

As is typical in any merger simulation study, the first modeling consideration regards the specification of a demand system. For this paper, the Linear Approximate Almost Ideal Demand System (LA/AIDS) will be used. Because the details of this model have been outlined in the previous two essays, they will not be presented here. As with the demand analysis of essay 2, the theoretical constraints of adding-up, homogeneity, and symmetry will all be imposed in this model.

Supply

Channel Coordination. As stated in the introduction, merger simulations will be first conducted using the conventional assumption of channel coordination. Because this model is formally presented in Essay 1, it will only be outlined here. Recall that for this model no distinction is made between manufacturers and retailers. The model is constructed as if manufacturers are selling their products directly to consumers. Using mean prices, expenditure shares, and demand elasticities (derived from the LA/AIDS model parameters), each manufacturer's first-order-conditions are solved for equilibrium marginal costs. Setting the marginal cost estimates aside, a merger is constructed by combining the profit maximization calculus of the two merging entities. In this post-merger setting, we now use the pre-merger marginal costs, mean price elasticities, and mean expenditures shares to solve the new first-order-conditions for equilibrium prices. These post-merger prices can then be compared to the observed pre-merger prices to determine the simulated effects of the merger.

Two-Stage game. Modeling a two-stage game between manufacturers and a single retailer requires that both upstream and downstream profit maximizing behavior must be explicitly considered. Since the assumption in this paper is that manufacturers behave as price leaders in their interactions with the retailer, the structure of the model must be such that wholesale price decisions are made with a complete understanding of how the retailer will respond to those decisions. This requirement is constructed via backward induction, which is outlined as follows:

(i) We first establish the retailer's objective function along with her profit maximization first-order-conditions.

(ii) In order for the manufacturers to understand how the retailer will respond to changes in wholesale prices, the retailer's first-order-conditions are differentiated with respect to wholesale prices.

(iii) The equations formed by step (ii) are solved for retail pass-through rates.

(iv) Next, we set up the manufacturer's profit function, which is maximized with respect to wholesale prices.

(v) Retail-pass-through rates from (iii) are substituted into the manufacturers' first-order-conditions to solve for equilibrium wholesale prices.

(vi) Finally, the equilibrium wholesale prices are substituted into the retailer's first-order conditions which are then solved for equilibrium retail prices.

To get a better idea of the steps above, consider the retailer's profit function:

$$\Pi^R = \sum_{i=1}^{N} (p_i - w_i) s_i M \ , \tag{4.1}$$

where, p_i and w_i are respectively, retail and wholesale prices for the *i*th good, s_i is the market share of the *i*th good (and is a function of all retail prices) and *M* is the total size of the market. Optimization with respect to all *N* retail prices yields the following first-order-conditions:

$$\frac{\partial \Pi^R}{\partial p_i} = s_i M + (p_i - w_i)\frac{\partial s_i}{\partial p_i} M + \sum_{j \neq i} (p_j - w_j)\frac{\partial s_j}{\partial p_i} M = 0 \quad \forall\, i = 1,\ldots, N \tag{4.2}$$

To determine how the retailer will respond to changes in wholesale prices, we differentiate the *N* first-order-conditions with respect to all wholesale prices. As outlined above, this new system of equations can then be solved for the retail pass-through-rates. Prior to working through the math of this procedure, it may initially seem overwhelming to perform such a task. For example, if *N=10,* that means we have 10 retail first-order-conditions. Differentiating each of these with respect to the 10 wholesale prices results in 100 new equations, which are supposed to then be solved for retail-pass-through rates! However, as will be shown, the math "works out" to be much simpler that this. Letting $\frac{\partial \Pi^R}{\partial p_i} = \Pi_i^{'R} \quad \forall\, i,$ and differentiating with respect to w_j we get:

$$\frac{\partial \Pi_i^{'R}}{\partial w_j} = \sum_{i=1}^{N}\left(\frac{\partial s_j}{\partial p_i} + \frac{\partial s_i}{\partial p_j} + \sum_{k=1}^{N}(p_k - w_k)\frac{\partial^2 s_k}{\partial p_j \partial p_i}\right)\frac{\partial p_i}{\partial w_j} = \frac{\partial s_j}{\partial p_i}, \tag{4.3}$$

where $\frac{\partial p_i}{\partial w_j}$ are the retail pass-through rates.

Although (4.3) produces a system of $N \times N$ equations in $N \times N$ unknowns (assuming everything in (4.3) is known except for the pass-through-rates), for each group of N pass-through-rates:

$$\frac{\partial p_1}{\partial w_1}, \frac{\partial p_2}{\partial w_1}, \frac{\partial p_3}{\partial w_1}, \ldots, \frac{\partial p_N}{\partial w_1}$$

only N of the $N \times N$ equations are needed to solve for the N unknowns. In matrix notation, for each j we can write (4.3) as:

$$G\begin{bmatrix} \frac{\partial p_1}{\partial w_j} \\ \frac{\partial p_2}{\partial w_j} \\ \vdots \\ \frac{\partial p_N}{\partial w_j} \end{bmatrix}_{N\times 1} = \begin{bmatrix} \frac{\partial s_j}{\partial p_1} \\ \frac{\partial s_j}{\partial p_2} \\ \vdots \\ \frac{\partial s_j}{\partial p_N} \end{bmatrix}_{N\times 1}, \tag{4.4}$$

where G is a $N \times N$ matrix with *ij*th element

$$g_{ik} = \frac{\partial s_j}{\partial p_i} + \frac{\partial s_i}{\partial p_j} + \sum_{k=1}^{N}(p_k - w_k)\frac{\partial^2 s_k}{\partial p_j \partial p_i} \tag{4.5}$$

Inverting equation (4.4) we get

$$\begin{bmatrix} \frac{\partial p_1}{\partial w_j} \\ \frac{\partial p_2}{\partial w_j} \\ \vdots \\ \frac{\partial p_N}{\partial w_j} \end{bmatrix}_{N\times 1} = G^{-1} \begin{bmatrix} \frac{\partial s_j}{\partial p_1} \\ \frac{\partial s_j}{\partial p_2} \\ \vdots \\ \frac{\partial s_j}{\partial p_N} \end{bmatrix}_{N\times 1} \quad , j = 1,\ldots, N \tag{4.5}$$

While the derivation of retail pass-through-rates in (4.5) is consistent with the structure of the model, it should be noted that there are alternative methods for obtaining these important measures. Besanko, Dube, and Gupta (2005) suggest a reduced form approach to calculating retail pass-through-rates. However, their procedure is much different from the one above in that they are actually econometrically estimating them as opposed to structurally deriving them. They propose the use of linear, log-linear, and polynomial price equations that are then estimated with OLS to obtain pass-through-rates. The equations are expressed as follows:

$$p_{ik} = \alpha_i + \sum_{k=1}^{K} \gamma_k STORE_k + \beta_i w_{ik} + \sum_{j \neq i} \beta_j w_{jk} + \theta_i HOLIDAY + \in_i \tag{4.6}$$

$$\ln(p_{ik}) = \alpha_i + \sum_{k=1}^{K} \gamma_k STORE_k + \beta_i \ln(w_{ik}) + \sum_{j \neq i} \beta_j \ln(w_{jk}) + \theta_i HOLIDAY + \in_i \tag{4.7}$$

$$p_{ik} = \alpha_i + \sum_{k=1}^{K} \gamma_k STORE_k + \sum_{r=1}^{3} \beta_{ir} (w_{ik})^r + \sum_{j \neq i} \beta_j w_{jk} + \theta_i HOLIDAY + \in_i \tag{4.8}$$

where, retail and wholesale prices are defined as above, *STORE* is a zero-one intercept shifter that accounts for any retail pricing variation across stores, *HOLIDAY* is a zero-one indicator that accounts for potential shifts in demand due to holidays such as New

Years Eve, President's Day, Easter, Memorial Day, 4th of July, Labor Day, Halloween, Thanksgiving, and Christmas. For (4.6) and (4.7), the pass-through-rates are simply estimated values of the β_i's and β_j's. For (4.8) cross-pass-through rates are the β_j's, but own-pass-through-rates are obtained with the following:

$$PTR_{ii} = \beta_{i1} + 2\beta_{i2} w_i + 3\beta_{i3} w_i^2$$

Now that we have solved for all retail-pass-through rates, we can establish how manufacturers use this information to establish profit maximizing wholesale prices. For each of manufacturer, we have the following profit function

$$\Pi^m = \sum_{k \subset N} (w_k - c_k) s_k M \ , \tag{4.9}$$

where w_k, s_k, and M are as defined above, and c_k is the manufacturing marginal cost of product *k*. The first-order-conditions are

$$\frac{\partial \Pi^m}{\partial w_k} = s_k + (w_k - c_k)\left(\frac{\partial s_k}{\partial p_k}\frac{\partial p_k}{\partial w_k}\right) + \sum_{j \neq k}^{N}\left(\frac{\partial s_k}{\partial p_j}\frac{\partial p_j}{\partial w_k}\right) = 0 \tag{4.10}$$[45]

Notice that in setting each wholesale price, the manufacturer takes into account, via the retail pass-through-rates, the changes in *all* retail prices due to a change in the wholesale price. Given average wholesale prices, shares, share derivatives, and pass-through-rates, we can solve equation (4.7) for marginal costs.

[45] With a little bit of algebra this expression could be converted to elasticity form. However, since derivatives of the share equations must be calculated in order to generate retail pass-through-rates, it makes more sense to leave them in this form.

To simulate a merger, we simply combine the maximization calculus of the merging manufacturers. The retailer's first-order-conditions remain the same, as do the pass-through-rates. The only thing that changes is the profit function and maximization conditions for the merging entity. Given pre-merger marginal costs, shares, share derivatives, and pass-through-rates, the post-merger version of (4.7) would then be solved for equilibrium wholesale prices. These post-merger wholesale prices are then fed into retail first-order-conditions that are then solved for post-merger retail prices.

Data and Results

As with the applications in Essays 1 and 2, the empirical exercise in this paper uses aggregate store-level data from the Dominick's Finer Foods database at the University of Chicago. The data consists of weekly sales, prices, discounts, and profit margins at the UPC-level for the 52-week period of 1992. The product category selected for this study is refrigerated juices. This category is comprised of 228 unique UPC codes. However, after some aggregation, 7 orange juice products were selected that account for approximately 65% of the total category. The seven products were obtained by combining UPCs of the same brand and package size whenever the correlation between their prices exceeded 0.8. While this is not the most rigorous technique for making aggregation decisions, it is nevertheless a common and accepted strategy in the marketing literature (see e.g. Nair, Dube, and Chintagunta, 2005). To obtain wholesale prices, weekly profit margin data was used as in the previous sections. Summary statistics for the 7 orange juice products are in Table 25 below.

TABLE 25 Summary Statistics for the Refrigerated Orange Juice Category

	Averages			
Product	Retail Price/ounce	Wholesale Price/ounce	Quantity (ounces)	Share*
Dominick's 64oz	.026	.017	1759483.17	17.35%
Trop. PP 64oz	.044	.030	1245164.679	22.18%
Trop. SB 64oz	.033	.023	1197198.491	16.21%
Trop. PP 96oz	.047	.034	606296.1509	14.00%
Minutemaid 64oz	.032	.024	1674488.755	19.71%
Minutemaid 96oz	.038	.028	240237.283	4.54%
Florida Natural 64oz	.044	.028	321531.1698	6.02%

Note: shares are with respect to the seven products listed.

Given 52 weeks of price and quantity data, 6 orange juice share equations were estimated using the SUR procedure in TSP 4.5. The “Florida Natural” share equation was dropped from the system to avoid data singularity. However, the theoretical restrictions of adding up, symmetry, and homogeneity were imposed, and the parameters for the dropped share equation were recovered via these restrictions. To account for serial correlation, the LA/AIDS equations were constructed using the Cochrane-Orcutt transformation (see Greene, 2003). In addition, quarterly dummy variables were included to account for seasonal changes in orange juice purchases. Estimation results can be found in Table 26.

As expected, all of the own-price coefficients are negative and statistically significant. The vast majority of cross-price coefficients are positive and significant, indicative of strong substitution in the category. Only two of the cross-price coefficients are negative, but they are not statistically different from zero at the 5 or 10 percent significance level. It appears that we could have gotten away with a more broad indicator of seasonality, as the majority of quarterly dummy coefficients are statistically insignificant. In terms of fit, all of the equations fit the data relatively well. The Cochran-Orcutt procedure does a good job of correcting for autocorrelation in all equations except the last one (Minutemaid 96 oz.).

TABLE 26 LA/AIDS Parameter Estimates and Fit Statistics for Refrigerated Orange Juice Share Equations

Parameter	Estimate	t-statistic	P-value	Parameter	Estimate	t-statistic	P-value
G11	-.499	-9.061	[.000]	G44	-.139	-4.477	[.000]
G12	.111	2.911	[.004]	G45	.006	.257	[.797]
G13	.157	3.290	[.001]	G46	.042	3.322	[.001]
G14	-.016	-.999	[.318]	A4	1.762	9.882	[.000]
G15	.240	5.043	[.000]	B4	-.102	-8.763	[.000]
G16	-.005	-.990	[.322]	D14	-.016	-1.418	[.156]
A1	-.336	-.544	[.587]	D24	-.022	-1.967	[.049]
B1	.023	.571	[.568]	D34	-.012	-1.070	[.285]
D11	.060	1.515	[.130]	G55	-.839	-10.356	[.000]
D21	.016	.415	[.678]	G56	.010	1.122	[.262]
D31	-.027	-.694	[.488]	A5	-1.156	-1.776	[.076]
RHO	.053	.860	[.390]	B5	.083	1.988	[.047]
G22	-.567	-10.954	[.000]	D15	.031	.751	[.452]
G23	.132	2.875	[.004]	D25	.001	.027	[.979]
G24	.042	2.583	[.010]	D35	.011	.259	[.796]
G25	.183	3.796	[.000]	G66	-.063	-2.491	[.013]
G26	.001	.278	[.781]	A6	.509	9.765	[.000]
A2	.827	1.540	[.123]	B6	-.030	-8.736	[.000]
B2	-.030	-.880	[.379]	D16	.000	.146	[.884]
D12	-.008	-.230	[.818]	D26	-.009	-2.749	[.006]
D22	.051	1.461	[.144]	D36	-.008	-2.531	[.011]
D32	.016	.451	[.652]				
G33	-.729	-9.095	[.000]				
G34	.021	.931	[.352]				
G35	.316	5.039	[.000]				
G36	.009	1.093	[.274]				
A3	-1.081	-1.684	[.092]				
B3	.080	1.937	[.053]				
D13	-.075	-1.866	[.062]				
D23	-.077	-1.920	[.055]				
D33	.033	.811	[.418]				

Equation	Adjusted R-Squared	Durbin Watson
Dominick's 64 oz.	.642	1.891
Tropicana PP 64 oz.	.729	2.018
Tropicana SB 64 oz.	.655	2.068
Tropicana PP 96 oz.	.694	2.217
Minutemaid 64 oz.	.704	2.171
Minutemaid 96 oz.	.767	1.395

Note: G's are price coefficients; A's are intercepts; B's are expenditure coefficients
D's are seasonality coefficients; and RHO is the AR(1) correlation coefficient

To get a better feel for the price responsiveness of demand in this category, uncompensated retail price elasticities were estimated. Also, since a two-stage game will be used to conduct merger simulations, wholesale price elasticities were calculated as well. The wholesale price elasticities were generated from a function of retail price elasticities and pass-through rates, which is expressed as follows:

$$\eta_{ij} = \varepsilon_{ij}\mu_{jj}\left(\frac{w_j}{p_j}\right) + \sum_{k\neq j}^{N}\varepsilon_{ik}\mu_{kj}\left(\frac{w_j}{p_k}\right), \tag{4.11}$$

where ε_{ij} are the retail price elasticities, $\mu_{ij} = \frac{\partial p_i}{\partial w_j}$ are the retail pass-through-rates, and w and p are wholesale and retail prices, respectively. Table 27 contains the retail- and wholesale-elasticity estimates. For comparative purposes, a matrix of elasticities for the same products, but from a different demand specification are included as well. These alternative elasticities were estimated by Nair, Dube, and Chintagunta (2005) using the Multiple-Discreteness Demand Model. Note that only the structurally derived pass-through-rates were used in the calculation of wholesale price elasticities. Although the reduced form pass-through-rates provide a useful comparison, it would not make sense to interact them with structurally derived retail demand elasticities. Instead of reporting the retail-pass-through rates, we report the pass-through elasticities. These are more easily comparable and are interpreted as the percentage change in retail price with respect to a percent change in wholesale price. The pass-through elasticities can be seen in Table 28.

TABLE 27 Uncompensated Retail Demand Elasticity Estimates and Computed Wholesale Demand Elasticities for Refrigerated Orange Juice

of	w.r.t.	Estimate	p-value	Estimate	WDE**	of	w.r.t.	Estimate	p-value	Estimate	WDE**
	DOM64	-3.901	[.000]	-2.747 *	-2.059		DOM64	1.145	[.000]	.361 *	-.289
	TRPrm64	.614	[.008]	.002	1.158		TRPrm64	.837	[.001]	.006	.987
	TRSB64	.887	[.002]	.034	.213		TRSB64	1.536	[.000]	.054	.427
DOM64	TRPrm96	-.111	[.250]	.064 *	.130	MM64	TRPrm96	-.030	[.795]	.131 *	.098
	MM64	1.358	[.000]	.348 *	.796		MM64	-5.340	[.000]	-2.627 *	-1.745
	MM96	-.037	[.263]	.015	-.066		MM96	.031	[.496]	.006	-.050
	FLR64	.060	[.679]	.001	.096		FLR64	.399	[.022]	.001	.225
	DOM64	.526	[.002]	.003	-.151		DOM64	-.004	[.974]	.009	-.266
	TRPrm64	-3.527	[.000]	-2.750 *	-.964		TRPrm64	.177	[.119]	.012	.266
	TRSB64	.616	[.004]	.034	.125		TRSB64	.314	[.099]	.007	-.055
TRPrm64	TRPrm96	.209	[.006]	.040 *	.124	MM96	TRPrm96	1.024	[.000]	.006	.499
	MM64	.854	[.000]	.009	.329		MM64	.348	[.067]	.003	.059
	MM96	.013	[.601]	.035 *	-.024		MM96	-2.362	[.000]	-3.063 *	-.904
	FLR64	.446	[.000]	.008	.172		FLR64	.159	[.308]	.005	.020
	DOM64	.886	[.002]	.070	-.461		DOM64	.265	[.522]	.001	-.241
	TRPrm64	.703	[.015]	.036	1.024		TRPrm64	1.702	[.000]	.002	.825
	TRSB64	-5.575	[.000]	-3.140 *	-2.063		TRSB64	1.612	[.004]	.001	.429
TRSB64	TRPrm96	.058	[.676]	.119 *	.113	FLR64	TRPrm96	.795	[.012]	.001	.343
	MM64	1.855	[.000]	.101 *	.852		MM64	1.466	[.009]	.000	.517
	MM96	.036	[.509]	.021	-.057		MM96	.108	[.358]	.003 *	-.022
	FLR64	.546	[.009]	.005	.289		FLR64	-6.556	[.000]	-3.192 *	-2.221
	DOM64	.011	[.918]	.078 *	-.190	Notes:	NDC = Nair, Dube, and Chintagunta				
	TRPrm64	.462	[.000]	.027 *	.345		* = statistically significant at the 10% level				
	TRSB64	.265	[.098]	.078 *	-.040		WDE = Wholesale Demand Elasticity				
TRPrm96	TRPrm96	-1.893	[.000]	-3.036 *	-.637		w.r.t.= with respect to				
	MM64	.184	[.234]	.145 *	.042	DOM64 = Dominick's 64 oz.					
	MM96	.335	[.000]	.011 *	.084	TRPrm64 = Tropicana Premium 64 oz.					
	FLR64	.362	[.008]	.002	.126	TRPSB64 = Tropicana Seasons Best 64 oz.					
						TRPrm96 = Tropicana Premium 96 oz.					
						MM64 = Minute Maid 64 oz.					
						MM96 = Minute Maid 96 oz.					
						FLR64 = Florida Natural 64 oz.					

All seven products are highly elastic and the substitution patterns are strong. In terms of the strongest competitor, cross-price elasticities with respect to MM64 price are the largest on average. There are no negative cross-price elasticities that are statistically different from zero at the 5, 10, or 20 percent level of significance, indicating that demand complements are virtually nonexistent in this product category. As expected, the own-wholesale-price elasticities are negative, but smaller in absolute value than the

TABLE 28 Pass-Through Elasticities Derived From the LA/AIDS Based Structural Model as Well as From Reduced Form Equations

		Pass-Through-Elasticities						Pass-Through-Elasticities			
Elasticity			Reduced Form			Elasticity			Reduced Form		
of	w.r.t.	LA/AIDS	Linear	LinLog	Poly	of	w.r.t.	LA/AIDS	Linear	LinLog	Poly
	DOM64	.91	2.16	1.97	2.26		DOM64	-.10	-.30	-.24	-.32
	TRPrm64	1.40	.28	.20	.25		TRPrm64	-.17	.05	.05	-.02
	TRSB64	.87	2.32	2.05	2.29		TRSB64	-.12	.29	.22	.26
DOM64	TRPrm96	1.28	1.15	.84	1.17	MM64	TRPrm96	-.16	-.42	-.52	-.39
	MM64	.88	-.31	-.37	-.25		MM64	.24	.71	.79	.79
	MM96	.75	1.41	1.07	1.61		MM96	-.09	1.83	1.71	1.84
	FLR64	1.24	-.35	-.20	-.40		FLR64	-.15	-.15	-.16	-.17
	DOM64	-.21	.50	.40	.51		DOM64	.02	-.02	-.02	.00
	TRPrm64	-.11	1.06	1.04	1.12		TRPrm64	.04	-.02	-.02	-.04
	TRSB64	-.31	.70	.55	.76		TRSB64	.02	.03	.03	.04
TRPrm64	TRPrm96	-.43	-.03	-.03	-.04	MM96	TRPrm96	.06	.11	.11	.08
	MM64	-.31	.14	.16	.15		MM64	.02	.03	.03	.05
	MM96	-.25	3.80	4.05	3.92		MM96	.41	.33	.33	.25
	FLR64	-.42	-.26	-.26	-.28		FLR64	.04	-.02	-.02	-.03
	DOM64	.05	-.44	-.37	-.16		DOM64	-.02	-.27	-.25	-.32
	TRPrm64	.15	-.17	-.13	-.10		TRPrm64	-.05	-.16	-.10	-.20
	TRSB64	.44	.17	.20	3.50		TRSB64	-.04	.89	.97	.93
TRSB64	TRPrm96	.15	.00	-.02	-.08	FLR64	TRPrm96	-.03	.21	.13	.19
	MM64	.09	-.19	-.21	-.31		MM64	-.04	-.40	-.46	-.45
	MM96	.09	-2.65	-2.76	-2.93		MM96	-.02	2.07	2.31	2.19
	FLR64	.15	.02	.02	.09		FLR64	.30	.35	.44	.23
	DOM64	-.02	.03	.02	.03						
	TRPrm64	-.06	.02	.02	.01						
	TRSB64	-.04	-.51	-.53	-.50						
TRPrm96	TRPrm96	.29	.99	1.00	1.00						
	MM64	-.04	.15	.15	.16						
	MM96	-.07	.31	.27	.37						
	FLR64	-.06	-.23	-.21	-.24						

Note: seet table 27 for definitions of product abbreviations.

their retail level counterparts. Overall, it appears that the wholesale price elasticities are simply scaled down versions of the retail price elasticities. There are only a few exceptions in which the pattern of substitution at the wholesale level changes from what it was at the retail level. It should be noted that in computing the wholesale price elasticites, retail price elasticities were only included in the formula if they were statistically different from zero. So, for example, the fact that the elasticity of DOM64 with respect to TRPrem64 switches from negative to positive in going from the retail level to the wholesale level, could be due to the exclusion of the negative and insignificant retail elasticity from the wholesale elasticity formula.

Four hypothetical mergers were simulated for the refrigerated orange juice category: 1) Tropicana/MinuteMaid, 2) Tropicana/Florida Natural, 3) MinuteMaid/Florida Natural, and 4) Dominick's/Florida Natural. As with the empirical work in Essays 1 and 2, this exercise begins with the assumption of channel coordination. After simulating the four mergers under this assumption, we then attempt to simulate the same mergers, but under the new assumption of Manufacturer Stackelberg game-play. As described above, this assumption implies a two-stage game in which the manufacturer moves first in setting wholesale prices, followed by the retailer who sets retail prices.

One question came up quite quickly before beginning the activity as described above. Which VSI assumption do we use to calculate premerger marginal costs? Or do we compute different marginal costs for each assumption? It was decided that one set of marginal costs should be used. That way, any differences in simulation results between the models could not be attributed to differences in marginal costs. However, out of curiosity, marginal costs were recovered using both assumptions and two sets of merger simulations were conducted, one for each set of marginal costs. Figure 18 summarizes the comparisons of interest.

FIGURE 18
ASSUMPTIONS REGARDING VSI FOR COMPUTING MARGINAL COSTS AND FOR SIMULATION OF MERGERS

		Merger Simulations Conducted Via	
		Channel Coordination	Manufacturer-Stackelberg
Marginal Costs Obtained Via:	Channel Coordination	CC/CC	CC/MS
	Manufacturer-Stackelberg	MS/CC	MS/MS

NOTE: CC = Channel Coordination
MS = Manufacturer Stackelberg
Comparison: CC/CC with CC/MS; MS/CC with MS/MS

In theory, the marginal costs obtained from the channel coordination game are composed of two parts; the marginal cost of manufacturing, and the marginal cost of retailing. Given observable retail and wholesale prices and an estimated demand system, by re-expressing equation (4.2) as

$$\frac{\partial \Pi^R}{\partial p_i} = s_i M + (p_i - w_i - r_i)\frac{\partial s_i}{\partial p_i} M + \sum_{j \neq i} (p_j - w_j - r_j)\frac{\partial s_j}{\partial p_i} M = 0 \quad \forall\, i = 1, ..., N\ ,$$

it is possible to recover the marginal cost of retailing *r*, for each product. Then, using derived pass-through-rates, mean prices, and share derivatives, we can obtain the marginal costs of manufacturing from equation (4.10). Marginal costs were obtained using both VSI assumptions. As expected, the marginal costs obtained from the channel coordination game are larger than the manufacturer marginal costs obtained in the stage-game setup. However, contrary to the simple theory presented above, the summation of manufacturer and retailer marginal costs do not equal the channel coordination counterpart. The marginal costs of retailing are all negative and large. Negative values are not a huge concern. In truth, the value *r*, does not merely represent the marginal cost of retailing; it represents the value of gross retailing costs, net any manufacturer side-payments such as promotional dollars, slotting allowances, or pay-to-stay fees (Chintagunta, 2002). However, the magnitude of these negative values seems highly unlikely. For this reason, we do not use the marginal costs of retailing in any of the merger simulations. We simply use the marginal costs obtained from the channel coordination game, as well as a set of "modified" (to be described below) manufacturing marginal costs obtained from the two-stage game. The original and modified marginal cost estimates obtained from each assumption regarding vertical interactions are located in Table 29.

Modification of the marginal costs came about as a result of the initial merger simulations. As will be seen, the results under channel coordination are fine, but those obtained with the two-stage game are not. In trying to discover what the problem could be, it was realized that this type of game does not "work well" when demand is inelastic at the manufacturing level. Experimenting with wholesale own-price elasticities I was able to get "better" results using manually inflated values. Setting wholesale own-price elasticities at 70% and 80% of retail elasticity values, half of the stage-game simulations

TABLE 29 Average Prices, Marginal Cost Estimates, and Modified Marginal Costs

Product	Average Retail Price	Average Wholesale Price	CC	MS		Modified Marginal Costs		
			MC	MCM	MCR	CCMC2	MSMC2	MSMC3
DOM64	0.026	0.017	0.019	0.009	-0.561	0.019	0.011	0.011
TRPrm64	0.044	0.030	0.030	-0.032	-0.546	0.030	0.014	0.016
TRSB64	0.033	0.023	0.026	0.005	-0.527	0.026	0.015	0.016
TRPrm96	0.047	0.034	0.054	-0.041	-0.504	0.051	0.017	0.020
MM64	0.032	0.024	0.026	0.010	-0.542	0.026	0.017	0.018
MM96	0.038	0.028	0.022	0.006	-0.372	0.022	0.015	0.016
FLR64	0.043	0.028	0.037	0.016	-0.509	0.037	0.022	0.023

Note: All values are per ounce. See table 27 for product name abbreviations
CC = channel coordination
MS = manufacturer-stackelberg
MC = marginal cost (obtained via channel coordination game)
MCM = maginal cost of manufacturering (obtained via MS game)
MCR = marginal cost of retailing (obtained via MS game)
CCMC2 = marginal cost obtained via CC, but with modified elasticity of TRPrm96 (-3)
MSMC2 = marginal cost obtained via MS, but with modified wholesale elasticities (70% of retail own-price elasticities)
MSMC3 = marginal cost obtained via MS, but with modified wholesale elasticities (80% of retail own-price elasticities)

were able to converge. However, a 20% or 30% reduction in the own-price elasticity of TRPrm96 was not enough to avoid "blown up" results. For this reason, I reset the retail own-price elasticity for this product to –3 (up from –1.89). To be consistent, I then re-estimated marginal costs using the various modifications described prior to conducting the simulations.

Merger simulation results can be found in Tables 30 and 31. The left-hand side of Table 30 contains simulation results obtained starting with the original channel coordination marginal costs. The right-hand side again uses channel coordination marginal costs but ones that have been modified by adjusting elasticity values. Both sides of Table 31 use modified marginal costs corresponding to columns "MSMC2" and "MSMC3" in Table 29. These were calculated using the stage-game setup but with wholesale price

TABLE 30 Simulated Post-Merger Price Changes Using Marginal Costs Obtained Via Channel Coordination

	Using Original CC MCs**			Using CCMC2 Marginal Costs**		
	Game I	Game II		Game I	Game II	
Merger	Retail	Wholesale	Retail	Retail	Wholesale	Retail
Tropicana/Minutemaid						
DOM64	-			-	-	.00%
TRPrm64	24.52%			21.16%	77.11%	77.11%
TRSB64	33.12%			29.65%	-10.59%	-10.59%
TRPrm96	60.52%	Did Not Converge		14.90%	80.60%	80.60%
MM64	37.23%			34.05%	19.83%	19.83%
MM96	130.94%			52.53%	12.56%	12.56%
FLR64	-			-	-	.00%
Tropicana/Florida Natural						
DOM64	-			-	-	.00%
TRPrm64	12.69%			10.29%	10.30%	10.30%
TRSB64	9.31%			7.81%	-17.06%	-17.06%
TRPrm96	27.82%	Did Not Converge		8.57%	47.33%	47.33%
MM64	-			-	-	.00%
MM96	-			-	-	.00%
FLR64	45.65%			35.15%	26.02%	26.02%
Minutemaid/Florida Natural						
DOM64	-	-	HUGE(-)	-	-	
TRPrm64	-	-	49.79%	-	-	
TRSB64	-	-	8056.63%	-	-	Did
TRPrm96	-	-	-2.52%	-	-	Not
MM64	2.87%	14.19%	28.08%	2.87%	1.31%	Converge
MM96	.00%	209.94%	HUGE(-)	.00%	17.65%	
FLR64	5.17%	83.21%	HUGE(-)	5.17%	7.24%	
Dominick's/Florida Natural						
DOM64	.00%	-2.78%	HUGE(-)	.00%	-.81%	-.81%
TRPrm64	-	-	65.13%	-	-	.00%
TRSB64	-	-	8056.63%	-	-	.00%
TRPrm96	-	-	-2.52%	-	-	.00%
MM64	-	-	25.38%	-	-	.00%
MM96	-	-	HUGE(-)	-	-	.00%
FLR64	.00%	18.89%	HUGE(-)	.00%	4.32%	4.32%

* Game I = Channel Coordination; Game II = Manufacturer Stackelberg
** See table 29 for abbreviation definitions
See table 27 for definitions of product name abbreviations

TABLE 31 Simulated Post-Merger Price Changes Using Marginal Costs Obtained Via Manufacturer-Stackelberg

	MSMC2 Marginal Costs**			MSMC3 Marginal Costs**		
	Game I*	Game II*		Game I*	Game II*	
Merger	Retail	Wholesale	Retail	Retail	Wholesale	Retail
Tropicana/Minutemaid						
DOM64	-	-	-59.52%	-	-	-59.52%
TRPrm64	21.16%	93.37%	8.50%	21.16%	40.74%	-21.03%
TRSB64	29.65%	-3.45%	-10.71%	29.65%	-4.08%	-11.29%
TRPrm96	14.90%	59.69%	-76.00%	14.90%	33.87%	-79.88%
MM64	34.05%	20.23%	-38.99%	34.05%	13.09%	-42.61%
MM96	52.53%	9.47%	-61.79%	52.53%	9.19%	-61.89%
FLR64	-	-	-58.08%	-	-	-58.08%
Tropicana/Florida Natural						
DOM64	-	-		-	-	
TRPrm64	10.29%	10.97%		10.29%	6.14%	
TRSB64	7.81%	-9.56%	Did	7.81%	-8.15%	Did
TRPrm96	8.57%	28.18%	Not	8.57%	18.14%	Not
MM64	-	-	Converge	-	-	Converge
MM96	-	-		-	-	
FLR64	35.15%	26.77%		35.15%	17.74%	
Minutemaid/Florida Natural						
DOM64	-	-		-	-	
TRPrm64	-	-		-	-	
TRSB64	-	-	Did	-	-	Did
TRPrm96	-	-	Not	-	-	Not
MM64	2.87%	1.32%	Converge	2.87%	.94%	Converge
MM96	.00%	16.81%		.00%	13.24%	
FLR64	5.17%	7.70%		5.17%	5.55%	
Dominick's/Florida Natural						
DOM64	.00%	-.81%		.00%	-.57%	
TRPrm64	-	-		-	-	
TRSB64	-	-	Did	-	-	Did
TRPrm96	-	-	Not	-	-	Not
MM64	-	-	Converge	-	-	Converge
MM96	-	-		-	-	
FLR64	.00%	4.32%		.00%	3.17%	

* Game I = Channel Coordination; Game II = Manufacturer Stackelberg

** See table 29 for definitions of abbreviations

Definitions of product name abbreviations can be found in table 27 elasticities scaled as 70% and 80% of their retail elasticity counterparts.

Given the inability of the stage-game merger simulations to converge to reasonable magnitudes without having to manually adjust the elasticities, it does not seem wise to attempt a comparison of the two approaches. It is reassuring to see that regardless of which set of marginal cost are used in the channel coordination game, that the results, in terms of identifying potentially problematic mergers (via the 5% rule) are quite robust. As with the channel coordination games in previous essays, this model intuitively predicts higher price increases when the dominant firms in the market join forces.

On the other hand, there seems to be no clear pattern in the few stage-game simulations that converged. For example, in the Tropicana/Minute Maid merger using modified marginal cost estimates, Table 30 displays results in which it appears that the retailer simply mimics the manufacturers' post-merger price increases (reductions) by passing on equally sized retail price increases (reductions) to final consumers. However,in Table 24, if a pattern exists in the stage game, it is that retailers slash prices in response to large increases (on average) in price from the merging firms. Since no weight can be placed on the believability of either of these results, the most that can be gleaned from this exercise is an awareness of what really drives the results.

Conclusions

Previous merger simulation research has made clear the importance of demand substitution parameters and their ability to drive simulation results. That is why so much time has been spent exploring the variation in results due to different specifications of demand. It appears that the importance of the underlying demand model is greatly increased by the structure of a two-stage game. Everything that determines the simulation results depends on the curvature and flexibility of the demand model. Retail demand elasticities obviously maintain this dependency. Retail pass-through-rates, by definition, depend on demand as well. In fact, numerous recent studies in marketing literature have identified the relationship between various demand specification/VSI combinations and ranges of retail pass-through-rates (see Besanko, Gupta, and Jain, 1998; Tyagi, 1999; Sudhir, 2001; Shugan and Desiraju, 2001; and Moorthy, 2005). Unfortunately, the LA/AIDS model is not one of the demand specifications that has been explored.

For stage-game merger simulations to be feasible and useful, it appears that a handful of issues need to be addressed. First, a better understanding of retail pass-through-rates and their dependence demand specification needs more research. The only demand models for which this has been done are the homogeneous logit and linear models. Additionally, the relationship between pass-through-rates and demand is also influenced by the assumption regarding VSI (Besanko, Gupta, and Jain, 1998; Sudhir, 2001). Thus, what is need, for example, is to have some general understanding of the range of pass-through-rates that could be obtained with, say, the LA/AIDS model in a Manufacturer-Stackelberg setting as opposed to a Vertical Nash setting. In addition to ranges, it would be ideal to know what parameters or demand variables are most influential in determining values within the range. For example, Sudhir (2001) shows that own-pass-through rates obtained within a logit-Manufacturer-Stackelberg setting are between 0 and 1 and are inversely proportional to own shares.

In beginning this study, it was hoped that an intuitive merger simulation comparison would be created based on two very different assumptions regarding the interactions between manufacturers and a single retailer. What culminated was a useful identification of future research topics that need to be addressed in order for merger simulations to move beyond the realm of coordinated channels.

CONCLUSIONS

Mentioned numerous times throughout this dissertation is the fact that the relatively short history of merger simulation research has primarily focused on the implications of demand modeling choices on post-merger price predictions. Essay 1 follows in the footsteps of this tradition by investigating the use of the Distance Metric Demand Model in bottled juice merger simulations. However, Essays 2 and 3 largely ignore the demand specification assumption in an effort to address other modeling issues such as retail price discrimination and supply channel stage-games. Despite the departure of these latter essays from the mainstream of merger simulation research, it could be argued that every paper in this dissertation (not just the first) serves to reinforce the need for even more research regarding the limitations that various demand models possess in terms of a practitioner's ability to implement more "realistic" assumptions in a merger simulation model.

Within this context, the contributions of Essay 1 are quite obvious. This section demonstrates the implementation of the Distance Metric Demand Model; a dimension-reducing, flexible, and easy-to-use method for conducting the front-end portion of horizontal merger simulations. Head-to-head comparisons with models such as the logit, and mixed logit, are needed to fully appreciate the characteristics of this model. However, it appears that the DM model does a very good job of producing intuitive and robust estimation results for categories involving large numbers of products as well as variation in observable product attributes.

Recall that one of the motivating factors behind the emergence of merger simulation was the challenge of defining relevant markets in highly differentiated product categories. However, it turns out that highly differentiated product industries pose a problem for merger simulation as well. If demand models fail to adequately reflect realistic substitution patterns, it could be hard to place any value on subsequent merger simulation predictions. Thus, in cases where it is deemed imperative to account for a large number of products and to estimate as accurately as possible the substitution patterns among those goods, the DM model appears to be a very good choice.

Although no direct comparisons to other models were made, the DM model for bottled juices had no difficulty handling a large number of products. In addition, from the results it is apparent that substitution patterns are not solely driven by market shares, thus it appears to be more flexible than the standard logit model. Finally, although there is some difficulty in determining which product attribute proximity measures to use, as well as the specification of those measures, the DM model is relatively easy to implement as opposed to the mixed logit or multiple discreteness models. Also, it was shown that the results were quite robust no matter what choice was made.

Although the major focus of Essay 2 was to demonstrate the effects of retail price discrimination on post-merger price simulations, it turns out that this issue could be addressed within the framework of alternative demand specification assumptions. To capture possible differences in retail pricing across demographically distinct geographic zones, the Essay 2 model simply estimated the same demand model using data corresponding to each price zone. However, there are other demand models that directly account for consumer heterogeneity that could do a better job of exploring the retail price-discrimination question. For example, the mixed logit model produces a distribution of parameter estimates, where the distribution is over a continuously defined set of consumer demographics. Thus, instead of comparing merger simulation results for a small discrete number of price zones, these models have the ability to produce a continuous range of post-merger price predictions based on the distribution of consumer heterogeneity. However, as mentioned previously, the present difficulty to estimate mixed logit models could have more sway over a practitioner's modeling decision than the possible benefits mentioned above.

Ultimately, whether or not demand models that account for consumer heterogeneity are used to further address retail zone pricing in a merger simulation context depends on at least one major question: do federal regulators care about distributions of post-merger price effects? For example, if it were shown that a proposed merger could have unacceptable welfare implications for a small subset of the population, would the regulatory authorities care? Essay 2 clearly demonstrated that the above scenario is quite possible. Retail zone pricing can result in "unacceptable" (according to the agencies' 5% rule-of-thumb regarding post-merger price changes) post-merger price effects for subsets of the population. Although it is beyond the scope of Essay 2 to determine whether or not the agencies care about such phenomena, the mere possibility of concern validates the objectives and conclusions of this Essay.

The initial objective of Essay 4 was to compare the post-merger price effects derived from two assumptions regarding the nature of vertical strategic interactions along the supply chain, i.e. channel coordination versus the two-stage Manufacturer-Stackelberg game. However, the challenge of obtaining reasonable results, if any at all, for the Manufacturer-Stackelberg model made it necessary to begin exploring the driving force behind structural models of the vertical channel. It was concluded that in order for alternative forms of channel game-play to be implemented into merger simulation research, additional work needs to be done to understand the relationship between demand models and retail pass-through-rates. By manually adjusting wholesale demand elasticities (which are functions of retail pass-through-rates) it was shown that certain values of these components can make a huge difference in the model's ability to converge to reasonable results.

Although the practice of merger simulation has now been established as a valuable tool to be used by both sides of the merger-approval debate, it is also apparent that additional research is necessary to fully establish the relative value of this tool. It has been demonstrated that demand exploration alone is still a valuable objective in this field, and is especially so when addressing other issues such as retail pricing and vertical strategic interactions. While many questions remain, this dissertation has made a solid contribution by providing not only interesting results, but directions to help guide future research in this field.

REFERENCES

Allenby, G.M., and Rossi, P.E. “Marketing Models of Consumer Heterogeneity.” *Journal of Econometrics*, Vol. 89 (1999), pp. 57-78.

Alston, J., Fost, K., and Green, R. “Estimating Elasticities with the Linear Approximate Almost Ideal Demand System: Some Monte Carlo Results.” *Review of Economics and Statistics,* Vol. 76 (1994), pp. 351-356.

Anderson, S.P., de Palma, A., and Thisse, J.F. *Discrete Choice Theory of Product Differentiation*. Cambridge: The MIT Press, 1992.

Aoki, N. “Beyond the Bag: This Summer, The Grower-Owners of Ocean Spray Voted to Remain Independent. Now, The Cooperative is Pushing a Plan of Attack to Survive Against Much Bigger Rivals.” *The Boston Globe*, September 26, 2004, p. E1, Business.

Baker, J.B., and Bresnahan, T.F. “The Gains from Merger or Collusion in Product-Differentiated Industries.” *The Journal of Industrial Economics*, Vol. 33 (1985), pp. 427-444.

Berry, S.T. “Estimating Discrete-Choice Models of Product Differentiation.” *RAND Journal of Economics,* Vol. 25 (1994), pp. 242-262.

_________, and Pakes, A. “Some Applications and Limitations of Recent Advances in Empirical Industrial Organization: Merger Analysis.” *The American Economic Review*, Vol. 83 (1993), pp. 247-252.

_________, __________, and Levinsohn, J. “Automobile Prices in Market Equilibrium.” *Econometrica*, Vol. 63 (1995), pp. 841-890.

Besanko, D., Gupta, S., and Jain, D. “Logit Demand Estimation Under Competitive Pricing Behavior: An Equilibrium Framework.” *Management Science*, Vol. 44 (1998), pp. 1533-1547.

___________, ___________, and Dube, J.P. “Competitive Price Discrimination Strategies in a Vertical Channel Using Aggregate Retail Data.” *Management Science*, Vol. 49 (2003), pp. 1121-1138.

_________, _________, and _________ “Own-Brand and Cross-Brand Retail Pass-Through.” *Marketing Science*, Vol. 24 (2005), pp. 123-137.

Bresnahan, T.F. “Empirical Studies of Industries with Market Power.” In R. Schmalensee and R.D. Willig, eds., *The Handbook of Industrial Organization.* New York: Elsevier Science Publishers B.V., 1989.

__________, S. Stern, and M. Trajtenberg. “Market Segmentation and the Sources of Rents From Innovation: Personal Computers in the Late 1980s.” *RAND Journal of Economics*, Vol. 28 (1997), pp. S17-S44.

Buse, A. “Evaluating the Linearized Almost Ideal Demand System.” *American Journal of Agricultural Economics*, Vol. 76 (1994), pp. 781-793.

Capps, Jr., O. “Utilizing Scanner Data to Estimate Retail Demand Functions for Meat Products.” *American Journal of Agricultural Economics*, Vol. 71 (1989), pp. 750-760.

___________, Tsai, R., Kirby, R., and Williams, G.W. “A Comparison of Demands for Meat Products in the Pacific Rim Region.” *Journal of Agricultural and Resource Economics*, Vol. 19(1994), pp. 210-224.

___________, Church, J., and Love, H.A. “Specification Issues and Confidence Intervals in Unilateral Price Effects Analysis.” *Journal of Econometrics*, Vol. 113 (2003), pp. 3-31.

___________, Clauson, A., and Pofahl, G.M. *Demand for Nonalcoholic Beverages: Evidence From the ACNielsen Home Scan Panel*. Working Paper, Department of Agricultural Economics, Texas A&M University, 2004.

Chamberlin, E.H. “Product Heterogeneity and Public Policy.” *The American Economic Review*, Vol. 40 (1950), pp. 85-92.

______________. *The Theory of Monopolistic Competition*, 8th Edition. Cambridge, MA: Harvard University Press, 1962.

Chintagunta, P. "Investigating Category Pricing Behavior at a Retail Chain." *Journal of Marketing Research*, Vol. 39 (2002), pp. 141-154.

____________, Dube, J.P., and Singh, V. "Balancing the Profitability and Customer Welfare in a Supermarket Chain." *Quantitative Marketing and Economics*, Vol. 1 (2003), pp. 111-147.

Choi, S.C. "Price Competition in a Channel Structure With a Common Retailer." *Marketing Science*, Vol. 10 (1991), pp. 271-296.

Church, J., and Ware, R. *Industrial Organization: A Strategic Approach*. New York: Irwin MacGraw-Hill, 2000.

Cooper, J.C., Froeb, L., O'Brien, D.P., and Tschantz, S. *Does Price Discrimination Intensify Competition? Implications for Antitrust.* Working Paper, U.S. Federal Trade Commission, and Department of Mathematics, Vanderbilt University, 2005.

Cotterill, R. "The Economics of Private Label Pricing and Channel Coordination." In G. Galizzi and L. Venturinin, eds., *Vertical Relationships and Coordination in the Food System*. New York: Physica-Verlag, 1999.

____________, Putsis, W.P. "Do Models of Vertical Strategic Interaction for National and Store Brands Meet the Market Test?" *Journal of Retailing*, Vol. 77 (2001), pp. 83-109.

CNN, "Justice Dept. Agrees Whirlpool Can Buy Maytag." March 29, 2006.

Crooke, P., Froeb, F., Tschantz, S., and Werden, G. "Effects of Assumed Demand Form on Simulated Postmerger Equilibria." *Review of Industrial Organization*, Vol. 15 (1999), pp. 205-217.

Day, S. "F.T.C. Moves to Stop $2.8 Billion Ice Cream Deal." *The New York Times*, March 5, 2003, p. C-6.

Deaton, A., and Muellbauer, J. "An Almost Ideal Demand System." *The American Economic Review*, Vol. 70 (1980a), pp. 312-326.

__________, and __________ *Economics and Consumer Behavior*. New York: Cambridge University Press, 1980b.

Diewart, W.E. "An Application of the Shephard Duality Theorem: A Generalized Leontief Production Function." *Journal of Political Economy*, Vol. 79 (1971), pp. 481-507.

Dixit, A., and Stiglitz, J. "Monopolistic Competition and Optimum Product Differentiation." *The American Economic Review*, Vol. 67 (1977), pp. 297-308.

Dube, J.P. "Multiple Discreteness and Product Differentiation: Demand for Carbonated Soft Drinks." *Marketing Science*, Vol. 23 (2004), pp. 66-81.

__________ "Product Differentiation and Mergers in the Carbonated Soft Drink Industry." *Journal of Economics & Management Strategy,* Vol. 14 (2005), pp. 879-904.

Edgerton, D. "Weak Separability and the Estimation of Elasticities in Multistage Demand Systems." *American Journal of Agricultural Economics*, Vol. 79 (1997), pp. 62-79.

Farrell, J., and Shapiro, C. "Horizontal Mergers: An Equilibrium Analysis." *The American Economic Review*, Vol. 80 (1990), pp. 107-126.

Froeb, L., Hosken, D., and Pappalardo, J. "Economics Research at the FTC: Information, Retrospectives, and Retailing." *Review of Industrial Organization,* Vol. 25 (2004), pp.353-374.

___________, Tschantz, S., and Werden, G. *Vertical Restraints and the Effects of Upstream Horizontal Mergers*. Working Paper, Owen Graduate School of Management, Vanderbilt University, 2005.

FTC, "*1992 Horizontal Merger Guidelines: With April 8, 1997, Revisions to Section 4 on Efficiencies*." http://www.ftc.gov/bc/docs/horizmer.htm, accessed August, 2006.

Gabszewicz, J.J., and Thisse, J.F. "Price Competition, Quality, and Income Disparities." *Journal of Economic Theory*, Vol. 20 (1979), pp. 340-359.

Green, R., and Alston, J. "Elasticities in AIDS Models." *American Journal of Agricultural Economics,* Vol. 72 (1990), pp. 442-445.

Greene, W.H. *Econometric Analysis,* Fifth Edition, New Jersey: Pearson Education, Inc., 2003.

Gujarati, D.N. *Basic Econometrics*, New York: McGraw-Hill, Inc., 1995.

Hanemann, W.M. "Quality and Demand Analysis." In G.C. Rausser ed., *New Directions in Econometric Modeling and Forecasting in U.S. Agriculture*. Elsevier/North Holland, Inc., New York, USA, 1982, pp. 55-98

Hausman, J. *Valuation of New Goods Under Perfect and Imperfect Competition*. Working Paper N. 4970, National Bureau of Economic Research, 1994.

___________, and Leonard, G. "Economic Analysis of Differentiated Products: Mergers Using Real World Data." *George Mason Law Review,* Vol. 5 (1997), pp. 321-346.

___________, and ___________ "Competitive Analysis Using a Flexible Demand Specification." *Journal of Competition Law and Economics,* Vol. 1 (2005), pp. 279-301.

___________, ___________, and Zona, J.D. “Competitive Analysis with Differentiated Products.” *Annales d’Economie et Statistique*, Vol. 34 (1994), pp. 159-180.

Hay, G., and Werden, G. “Horizontal Mergers: Law, Policy, and Economics.” *The American Economic Review*, Vol. 83 (1993), pp. 173-177.

Hendel, I. “Estimating Multiple-Discrete Choice Models: An Application to Computerization Returns.” *Review of Economic Studies*, Vol. 66 (1999), pp. 423-446.

Herper, M., and Schiffman, B. “Pepsi Bought Quaker. Now What?” *Forbes web site* (2001), http://www.forbes.com/2001/08/02/0802topnews.html (Accessed July 12, 2006).

Ho, D. “Government Regulators Approve Nestlé’s Purchase of Dreyer's.” *Business News*, June 25, 2003.

Hoch, S.J., Kim, B.D., Montgomery, A.L., and Rossi, P.E. “Determinants of Store-Level Price Elasticity.” *Journal of Marketing Research*, Vol. 32 (1995), pp. 17-29.

Hosken, D., O’Brien, D., Scheffman, D., and Vita, M. “Demand System Estimation and its Applications to Horizontal Merger Analysis.” Federal Trade Commission, Bureau of Economics Working Paper #246 (2002).

Hotelling, H. “Stability in Competition.” *Economic Journal*, Vol. 39 (1929), pp. 41-57.

Ivaldi, M., and Verboven, F. “Quantifying the Effects from Horizontal Mergers in European Competition Policy.” *International Journal of Industrial Organization*, Vol. 23 (2005), pp. 669-691.

Kadiyali, V., Chintagunta, P., and Vilcassim, N. “Manufacturer-Retailer Channel Interactions and Implications for Channel Power: An Empirical Investigation of Pricing in a Local Market.” *Marketing Science*, Vol. 19 (2000), pp. 127-148.

___________, Sudhir, K., and Rao, V.R. “Structural Analysis of Competitive Behavior: New Empirical Industrial Organization Methods in Marketing.” *International Journal of Research in Marketing*, Vol. 18 (2001), pp. 161-186.

Kalnins, A. “Hamburger Prices and Spatial Econometrics.” *Journal of Economics and Management Strategy*, Vol. 12 (2003), pp. 591-696.

Kaufman, P.R., MacDonald, J.M., Lutz, S.M., and Smallwood, D.M. *Do the Poor Pay More for Food? Item Selection and Price Differences Affect Low-Income Household Food Costs.* Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 759, 1997.

Kim, B.D., Blattberg, R.C., and Rossi, P.E. “Modeling the Distribution of Price Sensitivity and Implications for Optimal Retail Pricing.” *Journal of Business and Economic Statistics*, Vol. 3 (1995), pp. 291-303.

Klein, Joel I. “Statement of Joel I. Klein, Assistant Attorney General, Antitrust Division, U.S. Department of Justice, Before the Committee on the Judiciary, United States Senate Concerning Mergers and Corporate Consolidation.” Department of Justice, Washington, D.C., June 16, 1998.

Lancaster, K.J. “A New Approach to Consumer Theory.” *Journal of Political Economy*, Vol. 74 (1966), pp. 132-157.

____________. *Variety, Equity, and Efficiency*, New York: Columbia University Press, 1979.

Lewbel, A. “A Unified Approach to Incorporating Demographic or Other Effects into Demand Systems.” *The Review of Economic Studies*, Vol. 52 (1985), pp. 1-18.

Li, Q., and Racine, Jeffrey S. *Nonparametric Econometrics Theory and Practice*, Princeton, NJ: Princeton University Press, 2006.

Ma, L.Y. *Econometric Analysis of Competition in a Differentiated Product Industry: The U.S. Ready-To-Eat Cereal Industry*, Ph.D. Dissertation, Department of Agricultural & Resource Economics, University of Connecticut, 1997.

McFadden, D. "Conditional Logit Analysis of Qualitative Choice Behavior." In P. Zarembka, ed., *Frontiers of Econometrics*, New York: Academic Press, 1973.

___________, and Train, K. "Mixed MNL Models for Discrete Response." *Journal of Applied Econometrics*, Vol. 15 (2000), pp. 447-470.

Milliou, C., and Petrakis, E. *Upstream Horizontal Mergers, Bargaining, and Vertical Contracts*. Working Paper, Department of Economics, Universidad Carlos II de Madrid; Department of Economics, University of Crete, 2005.

Moorthy, S. "A General Theory of Pass-Through in Channels With Category Management and Retail Competition." *Marketing Science*, Vol. 24 (2005), pp. 110-122.

Moschini, G. "Units of Measurement and the Stone Index in Demand System Estimation." *American Journal of Agricultural Economics*, Vol. (1995), pp. 63-68.

Nair, H., Dube, J.P., and Chintagunta, P. "Accounting for Primary and Secondary Demand Effects with Aggregate Data." *Marketing Science*, Vol. 24 (2005), pp. 444-460.

Nevo, A. *Demand for Ready-to-Eat Cereal and its Implications for Price Competition, Merger Analysis, and Valuation of New Brands*, Ph.D. Dissertation, Department of Economics, Harvard University, 1997.

_________ "Mergers with Differentiated Products: The Case of the Ready-to-eat Cereal Industry." *RAND Journal of Economics*, Vol. 31 (2000a), pp. 395-421.

_________ "A Practitioner's Guide to Estimation of Random-Coefficients Logit Models of Demand." *Journal of Economics and Management Strategy*, Vol. 9 (2000b), pp. 513-548.

_________ "Measuring Market Power in the Ready-to-Eat Cereal Industry." *Econometrica*, Vol. 69 (2001), pp. 307-342.

O'Brien D., and Shaffer, G. "Bargaining, Bundling, and Clout: The Portfolio Effects of Horizontal Mergers." *RAND Journal of Economics* (forthcoming).

Petrin, A. "Quantifying the Benefits of New Products: The Case of the Minivan." *Journal of Political Economy*, Vol. 110 (2002), pp. 705-729.

Pinkse, J., and Slade, M. "Mergers, Brand Competition and the Price of a Pint." *European Economic Review,* Vol. 48 (2004), pp. 617-643.

Pofahl, G., Capps, O., and Love, H.A. "Retail Zone Pricing and Simulated Price Effects of Upstream Mergers." *International Journal of the Economics of Business*, Vol. 13 (2006), pp. 195-215.

Private Label Buyer. "Juice it Up! Shelf-Stable Juice Numbers for the Total Category Are Slowly Increasing, But It's the Private Label Programs That are Considered the Most Refreshing," December 2005, Vol. 19, p. 16.

The Providence Journal. "Juice Rivals Agree to Deal." September 25, 2004, p. B-01, Business.

Richards, T. *A Nested Logit Model of Strategic Promotion.* Working Paper, Morisson School of Agribusiness and Resource Management, Arizona State University, 2005.

Rojas, C. *Demand Estimation with Differentiated Products: An Application to Price Competition in the U.S. Brewing Industry*, Ph.D. Dissertation, Department of Economics, Virginia Polytechnic Institute and State University, 2005.

Sagon, C. "100% Confusion; Soft Drinks May be Out of Schools, But Are Juice Drinks Any Better?" *The Washington Post*, June 28, 2006, p. F01, Food.

Saha, A., and Simon, P. "Predicting the Price Effects of Mergers with Polynomial Logit Demand." *International Journal of the Economics of Business*, Vol. 7 (2000), pp. 149-157.

Salop, S. "Monopolistic Competition with Outside Goods." *Bell Journal of Economics*, Vol. 10 (1979), pp. 141-156.

Shankar, V., and Bolton, R.N. “An Empirical Analysis of Determinants of Retailing Pricing Strategy.” *Marketing Science*, Vol. 23 (2004), pp. 28-49.

Shepard, A. “Price Discrimination and Retail Configuration.” *Journal of Political Economy*, Vol. 99 (1991), pp. 30-52.

Shugan, S.M., and Desiraju, R. “Retail Product-line Pricing Strategy when Costs and Products Change.” *Journal of Retailing*, Vol. 77 (2001), pp. 17-38.

Slade, M.E. “Product Rivalry and Multiple Strategic Weapons: An Analysis of Price and Advertising Competition.” *Journal of Economics and Management Strategy*, Vol. 4 (1995), pp. 445-476.

Spence, M. “Product Selection, Fixed Costs, and Monopolistic Competition.” *Review of Economic Studies*, Vol. 43 (1976), pp. 217-235.

Sudhir, K. “Structural Analysis of Manufacturer Pricing in the Presence of a Strategic Retailer.” *Marketing Science*, Vol. 20 (2001), pp. 244-264.

Theil, H. *The System-Wide Approach to Microeconomics*. Chicago: University of Chicago Press, 1980.

Tirole, J. *The Theory of Industrial Organization*. Cambridge, MA: The MIT Press, 1988.

Train, K. *Discrete Choice Methods With Simulation*. New York: Cambridge University Press, 2003.

Tucker, D.S., and Sayyed, B. “The Merger Guidelines Commentary: Practical Guidance and Missed Opportunities.” *The Antitrust Source*, www.antitrustsource.com, May 2006.

Tyagi, R.K. “A Characterization of Retailer Response to Manufacturer Trade Deals.” *Journal of Marketing Research*, Vol. 36 (1999), pp. 510-516.

Van Damme, E., and Pinkse, J. *Merger Simulation Analysis: An Academic Perspective.* Working Paper, Department of Economics, The Pennsylvania State University, 2005.

Villas-Boas, J.M., and Winer, R.S. "Endogeneity in Brand Choice Models." *Management Science*, Vol. 45 (1999), pp. 1324-1338.

_______________, and Zhao, Y. "Retailer, Manufacturers, and Individual Consumers: Modeling the Supply Side in the Ketchup Marketplace." *Journal of Marketing Research*, Vol. XLII (2005), pp. 83-95.

Villas-Boas, S.B. *Vertical Contracts Between Manufacturers and Retailers: Inference with Limited Data*. Working Paper, University of California, Berkeley (2004).

Warner, M. "Kraft Foods Will Sell Altoids And Life Savers to Wrigley." *New York Times*, November 16, 2004, p. C-4.

Werden, G. "Simulating the Effects of Differentiated Products Mergers: A Practitioner's Guide." In J.A. Caswell and R.W. Cotterill, eds., *Strategy and Policy in the Food System: Emerging Issues*, Proceedings of NE-165 Conference, Washington D.C., 1996.

___________. "Simulating the Effects of Differentiated Products Mergers: A Practical Alternative to Structural Merger Policy." *George Mason Law Review*, Vol. 5 (1997), pp. 363-386.

___________, and Froeb, L. "The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy." *The Journal of Law, Economics, & Organization*, Vol. 10 (1994), pp. 407-426.

__________, and ___________, and Scheffman, D. "A Daubert Discipline for Merger Simulation." *Antitrust*, Summer (2004), pp. 89-95.

Woodbury, J.R., ed. “Whither Merger Simulation? An ABA Section Antitrust Law ‘Brown Bag’ Program Held January 29, 2004.” *The Antitrust Source*, May 2004, www.antitrustsource.com (accessed July 12, 2006).

APPENDIX A

SECTION 2 PARAMETER ESTIMATES FOR ALL 22 MODEL SPECIFICATIONS

Note: Use the following key for the parameters below:

L. = distance metric/cross-price interaction coefficients

Ai = share equation intercepts

Bi = normalized expenditure coefficients

Di = coefficients for summer dummy variable

Gii = own-price coefficients

RHO = AR(1) correlation coefficient

SPECIFICATION #1

```
L0  = coefficient for   lnPj
L1  = coefficient for   WB*lnPj
L2  = coefficient for   WF*lnPj
L3  = coefficient for   WVC*lnPj
L4  = coefficient for   WT*lnPj
L5  = coefficient for   WSU*lnPj
L6  = coefficient for   WSO*lnPj
L7  = coefficient for   WJ*lnPj
L8  = coefficient for   WD*lnPj
L9  = coefficient for   NNSU*lnPj
L10 = coefficient for   NNSO*lnPj
L11 = coefficient for   NNJ*lnPj
L12 = coefficient for   NND*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.746839E-03	.113140E-03	6.60099	[.000]
L1	-.152727E-02	.191955E-03	-7.95640	[.000]
L2	.185107E-02	.161085E-03	11.4913	[.000]
L3	.188709E-03	.126068E-03	1.49688	[.134]
L4	.510874E-03	.151546E-03	3.37109	[.001]
L5	.509630E-02	.713146E-03	7.14622	[.000]
L6	.453211E-03	.621025E-03	.729778	[.466]
L7	-.010963	.227239E-02	-4.82465	[.000]
L8	-.249664E-02	.317173E-03	-7.87153	[.000]
L9	-.362186E-02	.565447E-03	-6.40531	[.000]
L10	-.228337E-02	.594663E-03	-3.83978	[.000]
L11	.012745	.223079E-02	5.71321	[.000]
L12	.011222	.555128E-03	20.2143	[.000]
G11	-.327819	.843792E-02	-38.8507	[.000]
A1	-.024104	.135436	-.177973	[.859]
B1	-.048351	.886132E-02	-5.45640	[.000]
D1	.013467	.011839	1.13753	[.255]
RHO	.830818	.010549	78.7545	[.000]
G22	-.269806	.810602E-02	-33.2847	[.000]

A2	-.049842	.069191	-.720353	[.471]
B2	-.034785	.429309E-02	-8.10265	[.000]
D2	-.536679E-02	.580955E-02	-.923787	[.356]
G33	-.387041	.897752E-02	-43.1123	[.000]
A3	-.062558	.100523	-.622331	[.534]
B3	-.054517	.693986E-02	-7.85559	[.000]
D3	.013003	.872280E-02	1.49067	[.136]
G44	-.146867	.714985E-02	-20.5413	[.000]
A4	-.024254	.071943	-.337123	[.736]
B4	-.019633	.494014E-02	-3.97413	[.000]
D4	-.839364E-03	.630815E-02	-.133060	[.894]
G55	-.235762	.024344	-9.68447	[.000]
A5	-.203561	.080707	-2.52224	[.012]
B5	-.921297E-02	.248951E-02	-3.70072	[.000]
D5	-.699434E-02	.333002E-02	-2.10039	[.036]
G66	-.097438	.456954E-02	-21.3234	[.000]
A6	.058083	.048557	1.19618	[.232]
B6	-.756666E-02	.289891E-02	-2.61018	[.009]
D6	-.659175E-02	.387171E-02	-1.70254	[.089]
G77	-.130325	.603205E-02	-21.6054	[.000]
A7	.012799	.042086	.304104	[.761]
B7	-.973377E-02	.224621E-02	-4.33341	[.000]
D7	-.146515E-02	.301745E-02	-.485560	[.627]
G88	-.368862	.859577E-02	-42.9120	[.000]
A8	-.670368	.158534	-4.22853	[.000]
B8	-.010137	.010430	-.971848	[.331]
D8	.011121	.013872	.801653	[.423]
G99	-.097095	.273933E-02	-35.4449	[.000]
A9	.060779	.026408	2.30157	[.021]
B9	-.912245E-02	.158124E-02	-5.76917	[.000]
D9	-.336668E-02	.212412E-02	-1.58498	[.113]
G1010	-.117808	.327167E-02	-36.0087	[.000]
A10	.556395E-02	.030899	.180071	[.857]
B10	-.718834E-02	.185032E-02	-3.88492	[.000]
D10	-.533906E-02	.249284E-02	-2.14176	[.032]
G1111	-.092261	.270920E-02	-34.0548	[.000]
A11	.944157E-02	.030811	.306431	[.759]
B11	-.010361	.204961E-02	-5.05507	[.000]
D11	-.132810E-02	.262207E-02	-.506508	[.612]
G1212	-.104826	.389832E-02	-26.8900	[.000]
A12	.027476	.050355	.545651	[.585]
B12	-.012261	.304514E-02	-4.02636	[.000]
D12	-.849726E-03	.405670E-02	-.209462	[.834]
G1313	-.062379	.362203E-02	-17.2220	[.000]
A13	-.027497	.042885	-.641173	[.521]
B13	-.147499E-02	.290433E-02	-.507858	[.612]
D13	.549094E-03	.369125E-02	.148756	[.882]
G1414	-.310647	.664374E-02	-46.7578	[.000]
A14	-.886449	.102048	-8.68662	[.000]
B14	.012095	.670522E-02	1.80388	[.071]
D14	-.829207E-02	.887254E-02	-.934577	[.350]
G1515	-.090939	.317805E-02	-28.6147	[.000]
A15	-.021655	.039298	-.551036	[.582]
B15	-.589878E-02	.260622E-02	-2.26335	[.024]
D15	-.119490E-02	.337168E-02	-.354392	[.723]
G1616	-.124438	.019796	-6.28589	[.000]
A16	.865864E-02	.065317	.132562	[.895]
B16	-.532703E-02	.190232E-02	-2.80028	[.005]
D16	.116067E-02	.253301E-02	.458218	[.647]
G1717	-.088813	.194923E-02	-45.5633	[.000]
A17	.239142	.029588	8.08245	[.000]

B17	-.843201E-02	.175994E-02	-4.79107	[.000]
D17	.286252E-02	.220409E-02	1.29874	[.194]
G1818	-.091802	.549802E-02	-16.6973	[.000]
A18	-.032505	.043943	-.739704	[.459]
B18	-.174762E-02	.246380E-02	-.709318	[.478]
D18	-.516846E-02	.328764E-02	-1.57209	[.116]
G1919	-.158655	.021059	-7.53371	[.000]
A19	-.083585	.111485	-.749746	[.453]
B19	-.261318E-02	.568191E-02	-.459911	[.646]
D19	-.021392	.765554E-02	-2.79432	[.005]
G2020	-.096751	.260594E-02	-37.1272	[.000]
A20	-.111285	.022086	-5.03869	[.000]
B20	-.494205E-02	.124553E-02	-3.96784	[.000]
D20	-.571073E-03	.164518E-02	-.347120	[.729]
G2121	-.039690	.248243E-02	-15.9883	[.000]
A21	.086323	.024130	3.57747	[.000]
B21	-.521933E-02	.141158E-02	-3.69751	[.000]
D21	-.184582E-02	.188867E-02	-.977312	[.328]
G2222	-.012486	.587315E-02	-2.12589	[.034]
A22	.081068	.060815	1.33303	[.183]
B22	.816720E-03	.248581E-02	.328552	[.742]
D22	-.364821E-02	.337958E-02	-1.07948	[.280]
G2323	-.038849	.603976E-02	-6.43225	[.000]
A23	.383502	.045417	8.44397	[.000]
B23	-.170484E-04	.274420E-02	-.621250E-02	[.995]
D23	.217927E-02	.367248E-02	.593406	[.553]
G2424	-.024747	.314509E-02	-7.86833	[.000]
A24	.158006	.038952	4.05642	[.000]
B24	-.332173E-03	.232886E-02	-.142633	[.887]
D24	-.227659E-02	.310896E-02	-.732267	[.464]
G2525	-.062826	.176644E-02	-35.5667	[.000]
A25	.014982	.021266	.704522	[.481]
B25	-.236702E-02	.125240E-02	-1.89000	[.059]
D25	-.167327E-02	.167302E-02	-1.00015	[.317]
G2626	-.113878	.715470E-02	-15.9166	[.000]
A26	-.165077	.033654	-4.90507	[.000]
B26	-.984720E-03	.124428E-02	-.791397	[.429]
D26	.135249E-02	.165222E-02	.818592	[.413]
G2727	-.053783	.199231E-02	-26.9952	[.000]
A27	.013576	.023483	.578123	[.563]
B27	-.526805E-02	.153008E-02	-3.44299	[.001]
D27	-.163773E-02	.193067E-02	-.848272	[.396]
G2828	-.033310	.284963E-02	-11.6891	[.000]
A28	.055129	.033095	1.66575	[.096]
B28	-.256069E-02	.197063E-02	-1.29943	[.194]
D28	-.235001E-03	.264409E-02	-.088878	[.929]
G2929	-.043296	.224723E-02	-19.2665	[.000]
A29	.035283	.026560	1.32844	[.184]
B29	-.286696E-02	.175061E-02	-1.63770	[.101]
D29	.957924E-03	.223613E-02	.428385	[.668]
G3030	-.047929	.203010E-02	-23.6090	[.000]
A30	.089652	.017699	5.06534	[.000]
B30	-.210863E-02	.992305E-03	-2.12498	[.034]
D30	.438050E-03	.130604E-02	.335404	[.737]
G3131	-.033489	.225401E-02	-14.8573	[.000]
A31	.018844	.014974	1.25841	[.208]
B31	-.974109E-03	.729803E-03	-1.33476	[.182]
D31	-.792217E-03	.931719E-03	-.850274	[.395]
G3232	-.038342	.180773E-02	-21.2098	[.000]
A32	.057293	.017872	3.20574	[.001]
B32	-.683041E-03	.101994E-02	-.669685	[.503]

D32	-.126956E-02	.134849E-02	-.941466	[.346]
G3333	-.073946	.353969E-02	-20.8904	[.000]
A33	.042174	.025327	1.66519	[.096]
B33	.141554E-02	.121101E-02	1.16889	[.242]
D33	-.686676E-03	.158468E-02	-.433321	[.665]
G3434	-.095836	.554667E-02	-17.2781	[.000]
A34	.026695	.029386	.908418	[.364]
B34	.472826E-03	.133983E-02	.352899	[.724]
D34	.306738E-02	.176087E-02	1.74197	[.082]
G3535	-.079081	.350057E-02	-22.5910	[.000]
A35	-.059595	.023192	-2.56957	[.010]
B35	-.329777E-02	.109754E-02	-3.00471	[.003]
D35	-.707289E-07	.145644E-02	-.485629E-04	[1.00]
G3636	-.051156	.334741E-02	-15.2823	[.000]
A36	.052851	.028362	1.86345	[.062]
B36	.275318E-02	.153167E-02	1.79750	[.072]
D36	-.234696E-02	.200776E-02	-1.16894	[.242]
G3737	-.018719	.125329E-02	-14.9358	[.000]
A37	.191607	.023152	8.27600	[.000]
B37	.353903E-03	.128284E-02	.275876	[.783]
D37	-.291191E-03	.168497E-02	-.172817	[.863]
G3838	-.091328	.246408E-02	-37.0637	[.000]
A38	-.118937	.018823	-6.31861	[.000]
B38	-.188507E-02	.105979E-02	-1.77872	[.075]
D38	.778792E-03	.139105E-02	.559860	[.576]
G3939	-.100946	.400216E-02	-25.2229	[.000]
A39	.027931	.025084	1.11349	[.265]
B39	.103407E-02	.110238E-02	.938032	[.348]
D39	.232294E-02	.142809E-02	1.62661	[.104]
G4040	-.117592	.619340E-02	-18.9867	[.000]
A40	-.231280	.029770	-7.76878	[.000]
B40	-.205626E-02	.106175E-02	-1.93668	[.053]
D40	-.706258E-03	.140157E-02	-.503905	[.614]
G4141	-.063840	.243648E-02	-26.2017	[.000]
A41	-.059290	.016406	-3.61401	[.000]
B41	-.566492E-04	.863672E-03	-.065591	[.948]
D41	.929758E-03	.111379E-02	.834767	[.404]
G4242	-.097958	.378177E-02	-25.9027	[.000]
A42	.503578E-02	.024905	.202199	[.840]
B42	.313493E-02	.113752E-02	2.75593	[.006]
D42	.291839E-02	.147308E-02	1.98115	[.048]
G4343	-.082102	.415222E-02	-19.7730	[.000]
A43	.033332	.025699	1.29700	[.195]
B43	.207295E-02	.116110E-02	1.78532	[.074]
D43	.289295E-02	.151584E-02	1.90848	[.056]
G4444	-.096251	.912082E-02	-10.5528	[.000]
A44	-.041541	.044786	-.927536	[.354]
B44	.481506E-02	.169160E-02	2.84646	[.004]
D44	.112510E-02	.219344E-02	.512940	[.608]

SPECIFICATION #2

L0 = coefficient for lnPj
L1 = coefficient for WB*lnPj
L2 = coefficient for WF*lnPj
L3 = coefficient for WT*lnPj

```
L4  = coefficient for   WSU*lnPj
L5  = coefficient for   WJ*lnPj
L6  = coefficient for   WD*lnPj
L7  = coefficient for   NNSU*lnPj
L8  = coefficient for   NNSO*lnPj
L9  = coefficient for   NNJ*lnPj
L10 = coefficient for   NND*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.732164E-03	.112710E-03	6.49600	[.000]
L1	-.143357E-02	.183883E-03	-7.79611	[.000]
L2	.186209E-02	.160296E-03	11.6165	[.000]
L4	.578470E-03	.140864E-03	4.10660	[.000]
L5	.524549E-02	.709326E-03	7.39503	[.000]
L7	-.010636	.223070E-02	-4.76794	[.000]
L8	-.244820E-02	.313153E-03	-7.81789	[.000]
L9	-.373419E-02	.564941E-03	-6.60988	[.000]
L10	-.183521E-02	.157140E-03	-11.6788	[.000]
L11	.012411	.219028E-02	5.66622	[.000]
L12	.011143	.549399E-03	20.2826	[.000]
G11	-.327852	.836235E-02	-39.2057	[.000]
A1	-.018912	.135347	-.139730	[.889]
B1	-.048298	.886106E-02	-5.45064	[.000]
D1	.013462	.011830	1.13794	[.255]
RHO	.829819	.010571	78.4965	[.000]
G22	-.269444	.803745E-02	-33.5235	[.000]
A2	-.050678	.069076	-.733659	[.463]
B2	-.034711	.428965E-02	-8.09184	[.000]
D2	-.538247E-02	.580010E-02	-.927996	[.353]
G33	-.388342	.900054E-02	-43.1465	[.000]
A3	-.054971	.100402	-.547511	[.584]
B3	-.054754	.694505E-02	-7.88386	[.000]
D3	.012849	.871757E-02	1.47390	[.141]
G44	-.145215	.712561E-02	-20.3793	[.000]
A4	-.023982	.072059	-.332816	[.739]
B4	-.019371	.494391E-02	-3.91819	[.000]
D4	-.721497E-03	.631184E-02	-.114309	[.909]
G55	-.232407	.024157	-9.62087	[.000]
A5	-.201693	.080286	-2.51219	[.012]
B5	-.914297E-02	.249278E-02	-3.66777	[.000]
D5	-.712587E-02	.333489E-02	-2.13676	[.033]
G66	-.098055	.456629E-02	-21.4736	[.000]
A6	.054745	.048536	1.12792	[.259]
B6	-.743763E-02	.289736E-02	-2.56704	[.010]
D6	-.660019E-02	.386812E-02	-1.70630	[.088]
G77	-.129557	.596511E-02	-21.7192	[.000]
A7	.020557	.041219	.498732	[.618]
B7	-.973237E-02	.223252E-02	-4.35937	[.000]
D7	-.145673E-02	.299670E-02	-.486112	[.627]
G88	-.368884	.859376E-02	-42.9247	[.000]
A8	-.667392	.158485	-4.21106	[.000]
B8	-.010440	.010430	-1.00097	[.317]
D8	.010962	.013861	.790866	[.429]
G99	-.096820	.271127E-02	-35.7102	[.000]
A9	.060017	.026266	2.28495	[.022]
B9	-.904322E-02	.157530E-02	-5.74063	[.000]
D9	-.336783E-02	.211585E-02	-1.59172	[.111]
G1010	-.117380	.325326E-02	-36.0808	[.000]
A10	.548840E-02	.030715	.178685	[.858]
B10	-.709474E-02	.184102E-02	-3.85369	[.000]

D10	-.533715E-02	.247948E-02	-2.15253	[.031]
G1111	-.091679	.272079E-02	-33.6956	[.000]
A11	.958088E-02	.030944	.309623	[.757]
B11	-.010354	.205581E-02	-5.03645	[.000]
D11	-.130858E-02	.262987E-02	-.497584	[.619]
G1212	-.103957	.389936E-02	-26.6600	[.000]
A12	.027794	.050116	.554585	[.579]
B12	-.011794	.302668E-02	-3.89665	[.000]
D12	-.782034E-03	.406214E-02	-.192518	[.847]
G1313	-.061639	.360526E-02	-17.0971	[.000]
A13	-.027308	.042979	-.635392	[.525]
B13	-.140437E-02	.290697E-02	-.483104	[.629]
D13	.621128E-03	.369399E-02	.168145	[.866]
G1414	-.311401	.669685E-02	-46.4997	[.000]
A14	-.877906	.101868	-8.61809	[.000]
B14	.012124	.671038E-02	1.80675	[.071]
D14	-.820061E-02	.887184E-02	-.924342	[.355]
G1515	-.090051	.317170E-02	-28.3918	[.000]
A15	-.022168	.039430	-.562204	[.574]
B15	-.580635E-02	.261106E-02	-2.22375	[.026]
D15	-.117704E-02	.337921E-02	-.348320	[.728]
G1616	-.121574	.019955	-6.09249	[.000]
A16	.979891E-02	.065617	.149335	[.881]
B16	-.521635E-02	.187980E-02	-2.77495	[.006]
D16	.104855E-02	.250206E-02	.419076	[.675]
G1717	-.088652	.197629E-02	-44.8576	[.000]
A17	.243020	.029749	8.16895	[.000]
B17	-.857425E-02	.178351E-02	-4.80753	[.000]
D17	.273485E-02	.223797E-02	1.22202	[.222]
G1818	-.092064	.549921E-02	-16.7413	[.000]
A18	-.034250	.043916	-.779899	[.435]
B18	-.164608E-02	.246391E-02	-.668076	[.504]
D18	-.516765E-02	.328606E-02	-1.57259	[.116]
G1919	-.158549	.021011	-7.54610	[.000]
A19	-.079968	.111369	-.718042	[.473]
B19	-.291753E-02	.569175E-02	-.512588	[.608]
D19	-.021505	.766619E-02	-2.80515	[.005]
G2020	-.096921	.261296E-02	-37.0926	[.000]
A20	-.110956	.022168	-5.00535	[.000]
B20	-.505825E-02	.124748E-02	-4.05478	[.000]
D20	-.588151E-03	.164768E-02	-.356956	[.721]
G2121	-.039922	.242083E-02	-16.4909	[.000]
A21	.086040	.024200	3.55537	[.000]
B21	-.511497E-02	.141766E-02	-3.60804	[.000]
D21	-.181813E-02	.189785E-02	-.957994	[.338]
G2222	-.012138	.591921E-02	-2.05059	[.040]
A22	.078724	.060812	1.29455	[.195]
B22	.928568E-03	.248967E-02	.372969	[.709]
D22	-.365467E-02	.338080E-02	-1.08101	[.280]
G2323	-.039108	.611044E-02	-6.40015	[.000]
A23	.376248	.045212	8.32178	[.000]
B23	.136009E-03	.273411E-02	.049745	[.960]
D23	.210261E-02	.365885E-02	.574665	[.566]
G2424	-.025111	.312230E-02	-8.04232	[.000]
A24	.153083	.038936	3.93166	[.000]
B24	-.261843E-03	.232712E-02	-.112518	[.910]
D24	-.231089E-02	.310567E-02	-.744087	[.457]
G2525	-.062432	.176102E-02	-35.4523	[.000]
A25	.014486	.021241	.682010	[.495]
B25	-.227488E-02	.124992E-02	-1.82002	[.069]
D25	-.166619E-02	.166958E-02	-.997969	[.318]

G2626	-.113527	.704310E-02	-16.1189	[.000]
A26	-.169124	.033083	-5.11209	[.000]
B26	-.871338E-03	.122407E-02	-.711838	[.477]
D26	.129719E-02	.162193E-02	.799778	[.424]
G2727	-.053454	.199788E-02	-26.7555	[.000]
A27	.013915	.023597	.589693	[.555]
B27	-.529159E-02	.153496E-02	-3.44739	[.001]
D27	-.161897E-02	.193601E-02	-.836238	[.403]
G2828	-.033432	.284069E-02	-11.7689	[.000]
A28	.061121	.032794	1.86380	[.062]
B28	-.252265E-02	.196977E-02	-1.28069	[.200]
D28	-.191390E-03	.264210E-02	-.072438	[.942]
G2929	-.042821	.225083E-02	-19.0248	[.000]
A29	.035306	.026700	1.32233	[.186]
B29	-.286966E-02	.175813E-02	-1.63222	[.103]
D29	.992200E-03	.224453E-02	.442052	[.658]
G3030	-.046980	.196558E-02	-23.9013	[.000]
A30	.090148	.017502	5.15070	[.000]
B30	-.200423E-02	.982869E-03	-2.03916	[.041]
D30	.437457E-03	.129511E-02	.337776	[.736]
G3131	-.033594	.225713E-02	-14.8835	[.000]
A31	.019065	.014983	1.27245	[.203]
B31	-.109231E-02	.726524E-03	-1.50347	[.133]
D31	-.826099E-03	.928695E-03	-.889527	[.374]
G3232	-.038628	.174647E-02	-22.1176	[.000]
A32	.056281	.017866	3.15011	[.002]
B32	-.620919E-03	.102160E-02	-.607792	[.543]
D32	-.128237E-02	.135400E-02	-.947092	[.344]
G3333	-.073145	.354755E-02	-20.6185	[.000]
A33	.050002	.024419	2.04762	[.041]
B33	.140869E-02	.120986E-02	1.16434	[.244]
D33	-.681436E-03	.158282E-02	-.430521	[.667]
G3434	-.095508	.553737E-02	-17.2478	[.000]
A34	.032359	.028864	1.12106	[.262]
B34	.571493E-03	.135226E-02	.422622	[.673]
D34	.306459E-02	.178194E-02	1.71980	[.085]
G3535	-.078088	.349481E-02	-22.3441	[.000]
A35	-.050755	.022547	-2.25104	[.024]
B35	-.327938E-02	.108757E-02	-3.01533	[.003]
D35	.558992E-05	.144514E-02	.386808E-02	[.997]
G3636	-.050855	.331013E-02	-15.3635	[.000]
A36	.051423	.028324	1.81554	[.069]
B36	.280999E-02	.153088E-02	1.83554	[.066]
D36	-.237821E-02	.200813E-02	-1.18429	[.236]
G3737	-.019005	.126828E-02	-14.9850	[.000]
A37	.185344	.023402	7.91990	[.000]
B37	.437454E-03	.129818E-02	.336975	[.736]
D37	-.384681E-03	.170832E-02	-.225181	[.822]
G3838	-.091269	.246316E-02	-37.0536	[.000]
A38	-.118387	.018823	-6.28942	[.000]
B38	-.199274E-02	.106006E-02	-1.87984	[.060]
D38	.761978E-03	.139174E-02	.547500	[.584]
G3939	-.100461	.397624E-02	-25.2654	[.000]
A39	.034029	.024425	1.39322	[.164]
B39	.115221E-02	.111290E-02	1.03532	[.301]
D39	.232283E-02	.145089E-02	1.60097	[.109]
G4040	-.117470	.615318E-02	-19.0910	[.000]
A40	-.235130	.029371	-8.00539	[.000]
B40	-.191862E-02	.104215E-02	-1.84102	[.066]
D40	-.733838E-03	.137258E-02	-.534641	[.593]
G4141	-.063975	.241867E-02	-26.4504	[.000]

A41	-.059175	.016381	-3.61234	[.000]
B41	-.175886E-03	.859571E-03	-.204620	[.838]
D41	.896499E-03	.110897E-02	.808409	[.419]
G4242	-.097582	.374078E-02	-26.0860	[.000]
A42	.010838	.024291	.446174	[.655]
B42	.323972E-02	.115170E-02	2.81299	[.005]
D42	.291414E-02	.149958E-02	1.94330	[.052]
G4343	-.081811	.411659E-02	-19.8734	[.000]
A43	.038580	.025137	1.53478	[.125]
B43	.215932E-02	.117648E-02	1.83541	[.066]
D43	.288953E-02	.154155E-02	1.87443	[.061]
G4444	-.095171	.885634E-02	-10.7461	[.000]
A44	-.037948	.042350	-.896052	[.370]
B44	.487570E-02	.165364E-02	2.94847	[.003]
D44	.104881E-02	.214544E-02	.488857	[.625]

SPECIFICATION #3

L0 = coefficient for WF*lnPj
L1 = coefficient for WF*(SUJD)*lnPj
L2 = coefficient for (1 – WF)*lnPj
L3 = coefficient for (1 – WF)*(SUJD)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.193152E-02	.169016E-03	11.4281	[.000]
L1	.019961	.322081E-02	6.19757	[.000]
L2	.846173E-03	.770274E-04	10.9853	[.000]
L3	-.206813E-02	.789303E-03	-2.62020	[.009]
G11	-.344566	.920881E-02	-37.4170	[.000]
A1	-.099654	.137471	-.724906	[.469]
B1	-.055237	.902351E-02	-6.12143	[.000]
D1	.014391	.011987	1.20053	[.230]
RHO	.825305	.010878	75.8687	[.000]
G22	-.268508	.755896E-02	-35.5219	[.000]
A2	-.022258	.067850	-.328042	[.743]
B2	-.034553	.420965E-02	-8.20810	[.000]
D2	-.470398E-02	.566662E-02	-.830120	[.406]
G33	-.386133	.940596E-02	-41.0519	[.000]
A3	-.223782	.101321	-2.20863	[.027]
B3	-.053630	.708400E-02	-7.57057	[.000]
D3	.013742	.882676E-02	1.55683	[.120]
G44	-.136112	.753970E-02	-18.0527	[.000]
A4	.029130	.071908	.405103	[.685]
B4	-.017317	.496072E-02	-3.49088	[.000]
D4	.656007E-03	.627703E-02	.104509	[.917]
G55	-.251612	.027318	-9.21035	[.000]
A5	-.345552	.087054	-3.96941	[.000]
B5	-.013900	.236944E-02	-5.86648	[.000]
D5	-.742292E-02	.318034E-02	-2.33400	[.020]
G66	-.104387	.457759E-02	-22.8040	[.000]
A6	.019015	.048497	.392085	[.695]
B6	-.777701E-02	.292663E-02	-2.65733	[.008]
D6	-.534363E-02	.389381E-02	-1.37234	[.170]
G77	-.139373	.631059E-02	-22.0856	[.000]
A7	-.109502	.044514	-2.45998	[.014]

B7	-.011345	.247726E-02	-4.57965	[.000]
D7	-.153783E-02	.332927E-02	-.461911	[.644]
G88	-.372706	.790027E-02	-47.1763	[.000]
A8	-.808911	.165954	-4.87432	[.000]
B8	-.015296	.010906	-1.40246	[.161]
D8	.011523	.014488	.795307	[.426]
G99	-.104819	.259462E-02	-40.3986	[.000]
A9	.030993	.024991	1.24017	[.215]
B9	-.926631E-02	.149594E-02	-6.19432	[.000]
D9	-.250422E-02	.200069E-02	-1.25167	[.211]
G1010	-.111449	.303226E-02	-36.7545	[.000]
A10	-.010218	.028668	-.356436	[.722]
B10	-.779689E-02	.172837E-02	-4.51113	[.000]
D10	-.486041E-02	.231717E-02	-2.09757	[.036]
G1111	-.084349	.291838E-02	-28.9027	[.000]
A11	.011218	.031074	.361013	[.718]
B11	-.916853E-02	.207486E-02	-4.41887	[.000]
D11	-.868366E-03	.264296E-02	-.328558	[.742]
G1212	-.104276	.423687E-02	-24.6115	[.000]
A12	-.024414	.049442	-.493787	[.621]
B12	-.011905	.296495E-02	-4.01509	[.000]
D12	.963656E-03	.397516E-02	.242419	[.808]
G1313	-.066393	.351621E-02	-18.8821	[.000]
A13	.036701	.039437	.930634	[.352]
B13	-.480197E-02	.268613E-02	-1.78769	[.074]
D13	.118472E-02	.339051E-02	.349422	[.727]
G1414	-.322384	.862109E-02	-37.3948	[.000]
A14	-1.01913	.105224	-9.68532	[.000]
B14	.714550E-02	.704371E-02	1.01445	[.310]
D14	-.744627E-02	.919159E-02	-.810118	[.418]
G1515	-.084254	.334205E-02	-25.2102	[.000]
A15	-.035252	.039874	-.884098	[.377]
B15	-.509404E-02	.267665E-02	-1.90314	[.057]
D15	-.116333E-02	.342488E-02	-.339672	[.734]
G1616	-.135388	.020942	-6.46493	[.000]
A16	-.159374	.065880	-2.41917	[.016]
B16	-.556614E-02	.158288E-02	-3.51647	[.000]
D16	.151399E-02	.211630E-02	.715394	[.474]
G1717	-.091922	.189990E-02	-48.3824	[.000]
A17	.031507	.023835	1.32191	[.186]
B17	-.010117	.156370E-02	-6.46991	[.000]
D17	.252405E-02	.194390E-02	1.29844	[.194]
G1818	-.096066	.567035E-02	-16.9418	[.000]
A18	-.088700	.043769	-2.02652	[.043]
B18	-.259899E-02	.246479E-02	-1.05445	[.292]
D18	-.452321E-02	.327645E-02	-1.38052	[.167]
G1919	-.152496	.021980	-6.93792	[.000]
A19	-.213464	.114019	-1.87217	[.061]
B19	-.376057E-02	.577997E-02	-.650620	[.515]
D19	-.021229	.774026E-02	-2.74273	[.006]
G2020	-.096736	.248116E-02	-38.9884	[.000]
A20	-.084156	.023007	-3.65781	[.000]
B20	-.412004E-02	.134366E-02	-3.06627	[.002]
D20	-.525807E-03	.177631E-02	-.296010	[.767]
G2121	-.047595	.228131E-02	-20.8628	[.000]
A21	.089724	.021980	4.08208	[.000]
B21	-.537910E-02	.132611E-02	-4.05630	[.000]
D21	-.176596E-02	.177178E-02	-.996712	[.319]
G2222	-.012431	.612746E-02	-2.02871	[.042]
A22	.072221	.061225	1.17961	[.238]
B22	-.106786E-02	.249407E-02	-.428159	[.669]

D22	-.386998E-02	.338411E-02	-1.14358	[.253]
G2323	-.042419	.620945E-02	-6.83140	[.000]
A23	.232543	.044206	5.26040	[.000]
B23	.130900E-03	.277355E-02	.047196	[.962]
D23	.321307E-02	.365316E-02	.879533	[.379]
G2424	-.025197	.381976E-02	-6.59646	[.000]
A24	.118078	.041115	2.87192	[.004]
B24	-.281688E-02	.245547E-02	-1.14719	[.251]
D24	-.152425E-02	.327865E-02	-.464901	[.642]
G2525	-.062530	.159210E-02	-39.2750	[.000]
A25	.026691	.021303	1.25290	[.210]
B25	-.217974E-02	.128295E-02	-1.69901	[.089]
D25	-.125560E-02	.170901E-02	-.734696	[.463]
G2626	-.118091	.545324E-02	-21.6553	[.000]
A26	-.270351	.025062	-10.7873	[.000]
B26	-.227473E-02	.923723E-03	-2.46257	[.014]
D26	.118287E-02	.121811E-02	.971076	[.332]
G2727	-.050223	.199887E-02	-25.1256	[.000]
A27	.031403	.022388	1.40266	[.161]
B27	-.454182E-02	.145471E-02	-3.12215	[.002]
D27	-.156962E-02	.182565E-02	-.859761	[.390]
G2828	-.034982	.332449E-02	-10.5226	[.000]
A28	.066819	.034021	1.96407	[.050]
B28	-.194261E-02	.207688E-02	-.935350	[.350]
D28	-.825868E-03	.277866E-02	-.297219	[.766]
G2929	-.039872	.239123E-02	-16.6744	[.000]
A29	.050195	.025653	1.95668	[.050]
B29	-.246951E-02	.170541E-02	-1.44804	[.148]
D29	.147392E-02	.215203E-02	.684896	[.493]
G3030	-.052850	.197044E-02	-26.8215	[.000]
A30	.058361	.016367	3.56573	[.000]
B30	-.303442E-02	.904679E-03	-3.35414	[.001]
D30	.739783E-03	.118890E-02	.622243	[.534]
G3131	-.024008	.214705E-02	-11.1818	[.000]
A31	.066090	.013911	4.75085	[.000]
B31	-.149929E-02	.694732E-03	-2.15808	[.031]
D31	-.354787E-03	.902331E-03	-.393189	[.694]
G3232	-.039796	.169349E-02	-23.4993	[.000]
A32	.068584	.017638	3.88840	[.000]
B32	-.160824E-02	.102925E-02	-1.56254	[.118]
D32	-.140387E-02	.136563E-02	-1.02800	[.304]
G3333	-.069166	.331459E-02	-20.8673	[.000]
A33	-.041286	.021495	-1.92074	[.055]
B33	-.192825E-02	.106090E-02	-1.81755	[.069]
D33	-.126859E-02	.140894E-02	-.900387	[.368]
G3434	-.093507	.545357E-02	-17.1459	[.000]
A34	-.108567	.023999	-4.52374	[.000]
B34	-.306936E-02	.111177E-02	-2.76077	[.006]
D34	.273825E-02	.147700E-02	1.85393	[.064]
G3535	-.074424	.282158E-02	-26.3768	[.000]
A35	-.039017	.019965	-1.95424	[.051]
B35	-.271940E-02	.102056E-02	-2.66462	[.008]
D35	.189430E-03	.135238E-02	.140072	[.889]
G3636	-.049014	.258687E-02	-18.9471	[.000]
A36	.808885E-02	.025452	.317803	[.751]
B36	-.407612E-03	.145270E-02	-.280590	[.779]
D36	-.119395E-02	.192101E-02	-.621526	[.534]
G3737	-.021827	.154460E-02	-14.1313	[.000]
A37	.103589	.022077	4.69214	[.000]
B37	-.208072E-02	.133136E-02	-1.56286	[.118]
D37	-.573246E-03	.177179E-02	-.323541	[.746]

G3838	-.092759	.376603E-02	-24.6305	[.000]
A38	-.074586	.019685	-3.78895	[.000]
B38	-.124004E-02	.110106E-02	-1.12623	[.260]
D38	.100885E-02	.144506E-02	.698135	[.485]
G3939	-.090902	.414001E-02	-21.9571	[.000]
A39	-.112110	.019200	-5.83912	[.000]
B39	-.155918E-02	.902625E-03	-1.72738	[.084]
D39	.227802E-02	.118749E-02	1.91836	[.055]
G4040	-.120805	.527290E-02	-22.9106	[.000]
A40	-.304821	.023905	-12.7514	[.000]
B40	-.237857E-03	.849942E-03	-.279851	[.780]
D40	.356155E-03	.111086E-02	.320611	[.749]
G4141	-.066566	.347432E-02	-19.1596	[.000]
A41	.435457E-02	.014886	.292519	[.770]
B41	-.894129E-03	.789796E-03	-1.13210	[.258]
D41	.104281E-02	.100181E-02	1.04093	[.298]
G4242	-.089401	.361387E-02	-24.7384	[.000]
A42	-.120543	.017197	-7.00940	[.000]
B42	-.701028E-03	.799694E-03	-.876620	[.381]
D42	.242938E-02	.104608E-02	2.32237	[.020]
G4343	-.077514	.369730E-02	-20.9650	[.000]
A43	-.090974	.018043	-5.04216	[.000]
B43	-.123653E-02	.838386E-03	-1.47489	[.140]
D43	.255176E-02	.110203E-02	2.31551	[.021]
G4444	-.098482	.761858E-02	-12.9266	[.000]
A44	-.200207	.034617	-5.78345	[.000]
B44	.357145E-02	.130178E-02	2.74352	[.006]
D44	.137696E-02	.167721E-02	.820981	[.412]

SPECIFICATION #4

L0 = coefficient for WF*lnPj
L1 = coefficient for WF*(SUJD)*lnPj
L2 = coefficient for WF*(SUJD^2)*lnPj
L3 = coefficient for (1 – WF)*lnPj
L4 = coefficient for (1 – WF)*(SUJD)*lnPj
L5 = coefficient for (1 – WF)*(SUJD^2)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.381828E-03	.167997E-03	2.27283	[.023]
L1	.072300	.587668E-02	12.3029	[.000]
L2	-.134866	.019055	-7.07760	[.000]
L3	.788492E-03	.840402E-04	9.38232	[.000]
L4	.375661E-03	.203391E-02	.184698	[.853]
L5	-.960778E-02	.361244E-02	-2.65964	[.008]
G11	-.340840	.912842E-02	-37.3383	[.000]
A1	-.081935	.138011	-.593685	[.553]
B1	-.053878	.905572E-02	-5.94960	[.000]
D1	.014208	.012032	1.18086	[.238]
RHO	.825345	.010638	77.5821	[.000]
G22	-.276084	.810058E-02	-34.0820	[.000]
A2	-.048867	.068630	-.712027	[.476]
B2	-.034697	.421358E-02	-8.23452	[.000]
D2	-.513680E-02	.567438E-02	-.905261	[.365]
G33	-.386373	.947874E-02	-40.7621	[.000]

A3	-.225835	.102980	-2.19298	[.028]
B3	-.052408	.719351E-02	-7.28546	[.000]
D3	.013689	.896963E-02	1.52610	[.127]
G44	-.135020	.756325E-02	-17.8521	[.000]
A4	.046811	.073127	.640142	[.522]
B4	-.017427	.503666E-02	-3.46011	[.001]
D4	.108556E-02	.637629E-02	.170249	[.865]
G55	-.247819	.026041	-9.51640	[.000]
A5	-.343569	.083710	-4.10427	[.000]
B5	-.013983	.236574E-02	-5.91071	[.000]
D5	-.761591E-02	.317454E-02	-2.39906	[.016]
G66	-.102183	.457541E-02	-22.3331	[.000]
A6	.019211	.048158	.398914	[.690]
B6	-.790610E-02	.290934E-02	-2.71749	[.007]
D6	-.534474E-02	.386845E-02	-1.38162	[.167]
G77	-.137246	.585138E-02	-23.4553	[.000]
A7	-.110204	.044826	-2.45847	[.014]
B7	-.011441	.255584E-02	-4.47635	[.000]
D7	-.184659E-02	.343366E-02	-.537791	[.591]
G88	-.368448	.746112E-02	-49.3823	[.000]
A8	-.826874	.162922	-5.07528	[.000]
B8	-.013734	.010684	-1.28547	[.199]
D8	.011242	.014204	.791483	[.429]
G99	-.114329	.280600E-02	-40.7443	[.000]
A9	.018577	.025514	.728117	[.467]
B9	-.939762E-02	.150291E-02	-6.25293	[.000]
D9	-.276232E-02	.201025E-02	-1.37412	[.169]
G1010	-.120974	.321203E-02	-37.6629	[.000]
A10	-.022055	.029693	-.742760	[.458]
B10	-.792700E-02	.177402E-02	-4.46838	[.000]
D10	-.516928E-02	.237914E-02	-2.17275	[.030]
G1111	-.085689	.285407E-02	-30.0232	[.000]
A11	.819173E-02	.031056	.263770	[.792]
B11	-.949777E-02	.206895E-02	-4.59063	[.000]
D11	-.924430E-03	.263866E-02	-.350341	[.726]
G1212	-.104001	.458120E-02	-22.7016	[.000]
A12	-.245763E-02	.049840	-.049310	[.961]
B12	-.011956	.294880E-02	-4.05441	[.000]
D12	.129681E-02	.395351E-02	.328016	[.743]
G1313	-.066240	.351694E-02	-18.8346	[.000]
A13	.041131	.039781	1.03393	[.301]
B13	-.492990E-02	.270382E-02	-1.82331	[.068]
D13	.129861E-02	.341391E-02	.380390	[.704]
G1414	-.321379	.839517E-02	-38.2815	[.000]
A14	-1.02704	.105197	-9.76301	[.000]
B14	.914928E-02	.703268E-02	1.30097	[.193]
D14	-.707697E-02	.918918E-02	-.770142	[.441]
G1515	-.083713	.308031E-02	-27.1767	[.000]
A15	-.046646	.039951	-1.16757	[.243]
B15	-.522479E-02	.265673E-02	-1.96662	[.049]
D15	-.131534E-02	.342789E-02	-.383717	[.701]
G1616	-.134569	.020211	-6.65833	[.000]
A16	-.167784	.063916	-2.62506	[.009]
B16	-.563717E-02	.158700E-02	-3.55210	[.000]
D16	.136948E-02	.212159E-02	.645499	[.519]
G1717	-.092354	.192832E-02	-47.8935	[.000]
A17	.036618	.025707	1.42445	[.154]
B17	-.882553E-02	.168141E-02	-5.24889	[.000]
D17	.239117E-02	.210422E-02	1.13637	[.256]
G1818	-.095739	.536142E-02	-17.8570	[.000]
A18	-.098482	.043189	-2.28028	[.023]

B18	-.259399E-02	.246191E-02	-1.05365	[.292]
D18	-.451701E-02	.327529E-02	-1.37912	[.168]
G1919	-.146850	.022892	-6.41479	[.000]
A19	-.192066	.114929	-1.67117	[.095]
B19	-.452924E-02	.566849E-02	-.799020	[.424]
D19	-.021620	.757082E-02	-2.85576	[.004]
G2020	-.097931	.255788E-02	-38.2861	[.000]
A20	-.097168	.023251	-4.17906	[.000]
B20	-.325181E-02	.136657E-02	-2.37955	[.017]
D20	-.192677E-03	.179155E-02	-.107548	[.914]
G2121	-.047260	.207486E-02	-22.7772	[.000]
A21	.082830	.022002	3.76461	[.000]
B21	-.543333E-02	.133470E-02	-4.07084	[.000]
D21	-.172029E-02	.178146E-02	-.965666	[.334]
G2222	-.013966	.636459E-02	-2.19434	[.028]
A22	.068833	.063123	1.09045	[.276]
B22	-.123366E-02	.251840E-02	-.489860	[.624]
D22	-.402772E-02	.342003E-02	-1.17768	[.239]
G2323	-.041428	.650276E-02	-6.37090	[.000]
A23	.233702	.046056	5.07435	[.000]
B23	.186711E-02	.291346E-02	.640857	[.522]
D23	.316564E-02	.382773E-02	.827029	[.408]
G2424	-.024356	.383686E-02	-6.34795	[.000]
A24	.117326	.040746	2.87949	[.004]
B24	-.287811E-02	.243132E-02	-1.18376	[.237]
D24	-.159919E-02	.324540E-02	-.492757	[.622]
G2525	-.069572	.168645E-02	-41.2535	[.000]
A25	.023904	.021061	1.13496	[.256]
B25	-.251209E-02	.124590E-02	-2.01629	[.044]
D25	-.155039E-02	.165784E-02	-.935187	[.350]
G2626	-.117673	.585805E-02	-20.0874	[.000]
A26	-.270659	.026313	-10.2861	[.000]
B26	-.237766E-02	.925719E-03	-2.56844	[.010]
D26	.116487E-02	.122022E-02	.954646	[.340]
G2727	-.050117	.193623E-02	-25.8840	[.000]
A27	.105705E-03	.022159	.477026E-02	[.996]
B27	-.458513E-02	.141710E-02	-3.23558	[.001]
D27	-.194303E-02	.177587E-02	-1.09413	[.274]
G2828	-.034027	.329022E-02	-10.3419	[.000]
A28	.063100	.034251	1.84229	[.065]
B28	-.204139E-02	.208629E-02	-.978476	[.328]
D28	-.838636E-03	.279055E-02	-.300527	[.764]
G2929	-.040022	.247098E-02	-16.1970	[.000]
A29	.040634	.025740	1.57864	[.114]
B29	-.246349E-02	.171836E-02	-1.43363	[.152]
D29	.158026E-02	.216211E-02	.730885	[.465]
G3030	-.055092	.224281E-02	-24.5641	[.000]
A30	.053950	.017319	3.11504	[.002]
B30	-.312742E-02	.963237E-03	-3.24678	[.001]
D30	.849008E-03	.126845E-02	.669330	[.503]
G3131	-.021441	.208154E-02	-10.3003	[.000]
A31	.052441	.013681	3.83324	[.000]
B31	-.179130E-02	.689986E-03	-2.59614	[.009]
D31	-.355683E-03	.882566E-03	-.403010	[.687]
G3232	-.038514	.153528E-02	-25.0857	[.000]
A32	.056790	.017341	3.27488	[.001]
B32	-.166915E-02	.101846E-02	-1.63890	[.101]
D32	-.135300E-02	.134948E-02	-1.00261	[.316]
G3333	-.069289	.345982E-02	-20.0267	[.000]
A33	-.066243	.022340	-2.96522	[.003]
B33	-.204592E-02	.111883E-02	-1.82863	[.067]

D33	-.165229E-02	.148793E-02	-1.11047	[.267]
G3434	-.089359	.508309E-02	-17.5796	[.000]
A34	-.121513	.023100	-5.26035	[.000]
B34	-.339786E-02	.108913E-02	-3.11979	[.002]
D34	.240050E-02	.144589E-02	1.66022	[.097]
G3535	-.070819	.335489E-02	-21.1091	[.000]
A35	-.035004	.020751	-1.68686	[.092]
B35	-.282139E-02	.101522E-02	-2.77908	[.005]
D35	.337086E-04	.134520E-02	.025058	[.980]
G3636	-.050144	.239031E-02	-20.9781	[.000]
A36	-.137111E-02	.024761	-.055374	[.956]
B36	-.314223E-03	.142279E-02	-.220850	[.825]
D36	-.124723E-02	.187668E-02	-.664595	[.506]
G3737	-.020622	.149060E-02	-13.8346	[.000]
A37	.097409	.022231	4.38174	[.000]
B37	-.200552E-02	.133367E-02	-1.50377	[.133]
D37	-.628144E-03	.177308E-02	-.354268	[.723]
G3838	-.020537	.013011	-1.57841	[.114]
A38	-.075469	.019403	-3.88965	[.000]
B38	-.145578E-02	.107682E-02	-1.35193	[.176]
D38	.953762E-03	.140491E-02	.678878	[.497]
G3939	-.091517	.420156E-02	-21.7816	[.000]
A39	-.115629	.018997	-6.08680	[.000]
B39	-.227811E-02	.871548E-03	-2.61387	[.009]
D39	.200463E-02	.114604E-02	1.74917	[.080]
G4040	-.122283	.487744E-02	-25.0711	[.000]
A40	-.311788	.022889	-13.6220	[.000]
B40	-.567702E-03	.842819E-03	-.673575	[.501]
D40	.313416E-03	.110201E-02	.284404	[.776]
G4141	.419457E-02	.012882	.325613	[.745]
A41	.113396E-02	.015699	.072231	[.942]
B41	-.132006E-02	.831404E-03	-1.58775	[.112]
D41	.731169E-03	.104997E-02	.696368	[.486]
G4242	-.091785	.360793E-02	-25.4398	[.000]
A42	-.124959	.016850	-7.41576	[.000]
B42	-.142332E-02	.768199E-03	-1.85281	[.064]
D42	.217203E-02	.100399E-02	2.16340	[.031]
G4343	-.078568	.370904E-02	-21.1828	[.000]
A43	-.101209	.018138	-5.57982	[.000]
B43	-.131363E-02	.833198E-03	-1.57661	[.115]
D43	.240725E-02	.109395E-02	2.20052	[.028]
G4444	-.104341	.747654E-02	-13.9558	[.000]
A44	-.223875	.035058	-6.38589	[.000]
B44	.497910E-02	.140408E-02	3.54616	[.000]
D44	.142616E-02	.180442E-02	.790369	[.429]

SPECIFICATION #5

L0 = coefficient for WF*lnPj
L1 = coefficient for WF*(SUJD)*lnPj
L2 = coefficient for WF*(SUJD^2)*lnPj
L3 = coefficient for WF*(SUJD^3)*lnPj
L4 = coefficient for (1 – WF)*lnPj
L5 = coefficient for (1 – WF)*(SUJD)*lnPj
L6 = coefficient for (1 – WF)*(SUJD^2)*lnPj
L7 = coefficient for (1 – WF)*(SUJD^3)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.992029E-03	.184032E-03	5.39052	[.000]
L1	.041165	.854339E-02	4.81832	[.000]
L2	.079580	.050340	1.58085	[.114]
L3	-.320058	.065399	-4.89393	[.000]
L4	.787553E-03	.909794E-04	8.65640	[.000]
L5	.644701E-03	.368162E-02	.175113	[.861]
L6	-.879025E-02	.019798	-.444007	[.657]
L7	-.345678E-02	.022919	-.150825	[.880]
G11	-.340836	.899607E-02	-37.8873	[.000]
A1	-.081283	.138456	-.587064	[.557]
B1	-.053997	.908234E-02	-5.94522	[.000]
D1	.014184	.012070	1.17509	[.240]
RHO	.825246	.010854	76.0283	[.000]
G22	-.272271	.799167E-02	-34.0693	[.000]
A2	-.036492	.068457	-.533062	[.594]
B2	-.034663	.421302E-02	-8.22758	[.000]
D2	-.492521E-02	.567263E-02	-.868242	[.385]
G33	-.387099	.948436E-02	-40.8145	[.000]
A3	-.226316	.102736	-2.20289	[.028]
B3	-.052973	.717608E-02	-7.38181	[.000]
D3	.013615	.894798E-02	1.52156	[.128]
G44	-.134139	.752941E-02	-17.8153	[.000]
A4	.053258	.073456	.725039	[.468]
B4	-.017131	.504407E-02	-3.39633	[.001]
D4	.130897E-02	.640245E-02	.204448	[.838]
G55	-.245601	.026692	-9.20119	[.000]
A5	-.335659	.085432	-3.92896	[.000]
B5	-.013980	.236800E-02	-5.90379	[.000]
D5	-.758317E-02	.317782E-02	-2.38628	[.017]
G66	-.102488	.456224E-02	-22.4645	[.000]
A6	.019689	.048222	.408287	[.683]
B6	-.791199E-02	.291353E-02	-2.71560	[.007]
D6	-.534918E-02	.387419E-02	-1.38072	[.167]
G77	-.137257	.595936E-02	-23.0322	[.000]
A7	-.107438	.044700	-2.40356	[.016]
B7	-.011421	.253180E-02	-4.51088	[.000]
D7	-.179036E-02	.340171E-02	-.526313	[.599]
G88	-.370594	.758885E-02	-48.8340	[.000]
A8	-.827028	.162599	-5.08631	[.000]
B8	-.014320	.010665	-1.34265	[.179]
D8	.011127	.014169	.785258	[.432]
G99	-.111909	.286995E-02	-38.9933	[.000]
A9	.019371	.025537	.758536	[.448]
B9	-.938979E-02	.149700E-02	-6.27243	[.000]
D9	-.272773E-02	.200270E-02	-1.36203	[.173]
G1010	-.118405	.323404E-02	-36.6120	[.000]
A10	-.020371	.029541	-.689573	[.490]
B10	-.792791E-02	.175884E-02	-4.50746	[.000]
D10	-.512308E-02	.235895E-02	-2.17177	[.030]
G1111	-.084891	.293668E-02	-28.9073	[.000]
A11	.793826E-02	.031072	.255477	[.798]
B11	-.930162E-02	.207589E-02	-4.48079	[.000]
D11	-.870174E-03	.264127E-02	-.329453	[.742]
G1212	-.104362	.448153E-02	-23.2870	[.000]
A12	-.445082E-02	.049655	-.089636	[.929]
B12	-.011984	.294623E-02	-4.06756	[.000]
D12	.125454E-02	.394970E-02	.317629	[.751]
G1313	-.066089	.354970E-02	-18.6182	[.000]

A13	.044302	.039849	1.11175	[.266]
B13	-.484811E-02	.270526E-02	-1.79210	[.073]
D13	.133881E-02	.341838E-02	.391651	[.695]
G1414	-.321668	.840939E-02	-38.2510	[.000]
A14	-1.02836	.105273	-9.76852	[.000]
B14	.873721E-02	.703825E-02	1.24139	[.214]
D14	-.712332E-02	.919513E-02	-.774684	[.439]
G1515	-.083009	.338318E-02	-24.5357	[.000]
A15	-.045015	.039998	-1.12543	[.260]
B15	-.499426E-02	.267560E-02	-1.86659	[.062]
D15	-.125607E-02	.342783E-02	-.366432	[.714]
G1616	-.132771	.020664	-6.42508	[.000]
A16	-.159832	.065124	-2.45426	[.014]
B16	-.562571E-02	.158477E-02	-3.54987	[.000]
D16	.139942E-02	.211893E-02	.660437	[.509]
G1717	-.092359	.195174E-02	-47.3213	[.000]
A17	.032163	.025806	1.24631	[.213]
B17	-.920486E-02	.169003E-02	-5.44655	[.000]
D17	.238659E-02	.210584E-02	1.13332	[.257]
G1818	-.096628	.524128E-02	-18.4360	[.000]
A18	-.099046	.042894	-2.30908	[.021]
B18	-.256222E-02	.245525E-02	-1.04357	[.297]
D18	-.450668E-02	.326674E-02	-1.37956	[.168]
G1919	-.144330	.022996	-6.27626	[.000]
A19	-.183494	.115195	-1.59290	[.111]
B19	-.474289E-02	.568004E-02	-.835010	[.404]
D19	-.021641	.757560E-02	-2.85667	[.004]
G2020	-.097974	.258687E-02	-37.8738	[.000]
A20	-.098462	.023239	-4.23700	[.000]
B20	-.293389E-02	.137102E-02	-2.13993	[.032]
D20	-.104737E-03	.179283E-02	-.058420	[.953]
G2121	-.047549	.208511E-02	-22.8041	[.000]
A21	.083902	.022038	3.80712	[.000]
B21	-.543677E-02	.133275E-02	-4.07937	[.000]
D21	-.175452E-02	.177909E-02	-.986189	[.324]
G2222	-.013083	.623920E-02	-2.09684	[.036]
A22	.076240	.062307	1.22362	[.221]
B22	-.124726E-02	.251498E-02	-.495932	[.620]
D22	-.396754E-02	.341342E-02	-1.16234	[.245]
G2323	-.041103	.643657E-02	-6.38583	[.000]
A23	.227241	.046826	4.85287	[.000]
B23	.221468E-02	.296966E-02	.745768	[.456]
D23	.332116E-02	.389244E-02	.853233	[.394]
G2424	-.024944	.387951E-02	-6.42959	[.000]
A24	.115621	.040909	2.82633	[.005]
B24	-.283662E-02	.243872E-02	-1.16316	[.245]
D24	-.159579E-02	.325429E-02	-.490366	[.624]
G2525	-.067634	.169587E-02	-39.8819	[.000]
A25	.024110	.021256	1.13428	[.257]
B25	-.245523E-02	.125197E-02	-1.96110	[.050]
D25	-.149148E-02	.166645E-02	-.895004	[.371]
G2626	-.118091	.577582E-02	-20.4457	[.000]
A26	-.271691	.026084	-10.4159	[.000]
B26	-.239491E-02	.925325E-03	-2.58818	[.010]
D26	.117403E-02	.121997E-02	.962342	[.336]
G2727	-.049719	.197847E-02	-25.1302	[.000]
A27	-.795283E-03	.022207	-.035812	[.971]
B27	-.452533E-02	.142093E-02	-3.18477	[.001]
D27	-.203816E-02	.177377E-02	-1.14906	[.251]
G2828	-.034527	.324680E-02	-10.6343	[.000]
A28	.062543	.034129	1.83257	[.067]

B28	-.201611E-02	.208218E-02	-.968266	[.333]
D28	-.833778E-03	.278501E-02	-.299380	[.765]
G2929	-.039800	.249015E-02	-15.9828	[.000]
A29	.043844	.025700	1.70601	[.088]
B29	-.246518E-02	.171772E-02	-1.43515	[.151]
D29	.155665E-02	.215887E-02	.721050	[.471]
G3030	-.053229	.221896E-02	-23.9881	[.000]
A30	.054923	.016618	3.30516	[.001]
B30	-.308984E-02	.917024E-03	-3.36942	[.001]
D30	.794794E-03	.120549E-02	.659313	[.510]
G3131	-.020666	.246663E-02	-8.37841	[.000]
A31	.058309	.013794	4.22711	[.000]
B31	-.176090E-02	.700582E-03	-2.51348	[.012]
D31	-.314554E-03	.876967E-03	-.358684	[.720]
G3232	-.038610	.156059E-02	-24.7407	[.000]
A32	.059390	.017367	3.41971	[.001]
B32	-.166579E-02	.101618E-02	-1.63927	[.101]
D32	-.136771E-02	.134681E-02	-1.01552	[.310]
G3333	-.068116	.347907E-02	-19.5788	[.000]
A33	-.053354	.022081	-2.41630	[.016]
B33	-.202757E-02	.108442E-02	-1.86972	[.062]
D33	-.158095E-02	.144137E-02	-1.09684	[.273]
G3434	-.090365	.531008E-02	-17.0176	[.000]
A34	-.117992	.023384	-5.04581	[.000]
B34	-.328167E-02	.109239E-02	-3.00412	[.003]
D34	.251524E-02	.145032E-02	1.73427	[.083]
G3535	-.071216	.343866E-02	-20.7103	[.000]
A35	-.036506	.020856	-1.75039	[.080]
B35	-.283497E-02	.100418E-02	-2.82318	[.005]
D35	.428255E-05	.133018E-02	.321953E-02	[.997]
G3636	-.050446	.239116E-02	-21.0970	[.000]
A36	-.163546E-02	.024780	-.066000	[.947]
B36	-.270126E-03	.142710E-02	-.189283	[.850]
D36	-.124230E-02	.188157E-02	-.660248	[.509]
G3737	-.020983	.145190E-02	-14.4524	[.000]
A37	.098389	.022178	4.43637	[.000]
B37	-.199133E-02	.133459E-02	-1.49209	[.136]
D37	-.629599E-03	.177439E-02	-.354826	[.723]
G3838	.082167	.024236	3.39025	[.001]
A38	-.075391	.019046	-3.95826	[.000]
B38	-.123417E-02	.106182E-02	-1.16231	[.245]
D38	.108458E-02	.137804E-02	.787046	[.431]
G3939	-.093839	.444783E-02	-21.0977	[.000]
A39	-.116919	.019166	-6.10034	[.000]
B39	-.202786E-02	.877269E-03	-2.31157	[.021]
D39	.210206E-02	.115338E-02	1.82252	[.068]
G4040	-.122565	.484055E-02	-25.3206	[.000]
A40	-.312409	.022801	-13.7014	[.000]
B40	-.531181E-03	.842192E-03	-.630712	[.528]
D40	.316762E-03	.110126E-02	.287635	[.774]
G4141	.106872	.024170	4.42167	[.000]
A41	.308678E-02	.017240	.179051	[.858]
B41	-.123218E-02	.917065E-03	-1.34361	[.179]
D41	.663496E-03	.115850E-02	.572720	[.567]
G4242	-.094322	.387681E-02	-24.3298	[.000]
A42	-.126132	.017000	-7.41946	[.000]
B42	-.117015E-02	.772755E-03	-1.51425	[.130]
D42	.227777E-02	.100980E-02	2.25565	[.024]
G4343	-.078994	.374212E-02	-21.1093	[.000]
A43	-.100928	.018143	-5.56296	[.000]
B43	-.131077E-02	.832832E-03	-1.57387	[.116]

D43	.245895E-02	.109445E-02	2.24674	[.025]
G4444	-.103029	.748069E-02	-13.7727	[.000]
A44	-.218806	.034708	-6.30420	[.000]
B44	.430651E-02	.138004E-02	3.12057	[.002]
D44	.138446E-02	.175276E-02	.789873	[.430]

SPECIFICATION #6

L0 = coefficient for WF*lnPj
L1 = coefficient for WF*(SUJD)*lnPj
L2 = coefficient for WF*(SUJD^2)*lnPj
L3 = coefficient for WF*(SUJD^3)*lnPj
L4 = coefficient for WF*(SUJD^4)*lnPj
L5 = coefficient for (1 – WF)*lnPj
L6 = coefficient for (1 – WF)*(SUJD)*lnPj
L7 = coefficient for (1 – WF)*(SUJD^2)*lnPj
L8 = coefficient for (1 – WF)*(SUJD^3)*lnPj
L9 = coefficient for (1 – WF)*(SUJD^4)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.168158E-02	.202279E-03	8.31319	[.000]
L1	-.150874E-02	.010673	-.141366	[.888]
L2	.527507	.114360	4.61270	[.000]
L3	-1.69950	.349025	-4.86928	[.000]
L4	1.21218	.264394	4.58475	[.000]
L5	.608515E-03	.103909E-03	5.85624	[.000]
L6	.021692	.552267E-02	3.92776	[.000]
L7	-.325835	.054021	-6.03161	[.000]
L8	1.09265	.152254	7.17652	[.000]
L9	-.978399	.124331	-7.86930	[.000]
G11	-.343079	.951184E-02	-36.0686	[.000]
A1	-.082036	.138820	-.590949	[.555]
B1	-.054602	.911328E-02	-5.99144	[.000]
D1	.014514	.012170	1.19264	[.233]
RHO	.831744	.011317	73.4920	[.000]
G22	-.271242	.802330E-02	-33.8068	[.000]
A2	-.027944	.068170	-.409911	[.682]
B2	-.034653	.420555E-02	-8.23979	[.000]
D2	-.469331E-02	.569597E-02	-.823971	[.410]
G33	-.389910	.952504E-02	-40.9352	[.000]
A3	-.224816	.102430	-2.19483	[.028]
B3	-.054117	.716928E-02	-7.54843	[.000]
D3	.013727	.897445E-02	1.52954	[.126]
G44	-.138973	.747710E-02	-18.5865	[.000]
A4	.053527	.072844	.734815	[.462]
B4	-.017800	.501619E-02	-3.54844	[.000]
D4	.930419E-03	.639317E-02	.145533	[.884]
G55	-.247314	.025190	-9.81811	[.000]
A5	-.339608	.081526	-4.16564	[.000]
B5	-.014036	.236326E-02	-5.93919	[.000]
D5	-.756737E-02	.318952E-02	-2.37257	[.018]
G66	-.105155	.444398E-02	-23.6624	[.000]
A6	.015928	.048182	.330592	[.741]
B6	-.768792E-02	.291418E-02	-2.63811	[.008]
D6	-.518728E-02	.390030E-02	-1.32997	[.184]

G77	-.138372	.603863E-02	-22.9144	[.000]
A7	-.111666	.044413	-2.51429	[.012]
B7	-.011241	.250079E-02	-4.49505	[.000]
D7	-.183189E-02	.338077E-02	-.541856	[.588]
G88	-.370403	.711253E-02	-52.0775	[.000]
A8	-.845198	.161801	-5.22369	[.000]
B8	-.014532	.010584	-1.37293	[.170]
D8	.011029	.014162	.778763	[.436]
G99	-.108565	.269760E-02	-40.2451	[.000]
A9	.029394	.024937	1.17872	[.239]
B9	-.931677E-02	.149623E-02	-6.22684	[.000]
D9	-.243810E-02	.201324E-02	-1.21104	[.226]
G1010	-.115343	.309759E-02	-37.2362	[.000]
A10	-.983947E-02	.029033	-.338911	[.735]
B10	-.784559E-02	.175370E-02	-4.47374	[.000]
D10	-.486223E-02	.236579E-02	-2.05522	[.040]
G1111	-.086116	.287525E-02	-29.9506	[.000]
A11	.011344	.030977	.366205	[.714]
B11	-.946575E-02	.206948E-02	-4.57398	[.000]
D11	-.918125E-03	.265152E-02	-.346264	[.729]
G1212	-.103017	.415309E-02	-24.8048	[.000]
A12	.010481	.048929	.214215	[.830]
B12	-.011989	.292706E-02	-4.09586	[.000]
D12	.148972E-02	.394735E-02	.377397	[.706]
G1313	-.066475	.341639E-02	-19.4577	[.000]
A13	.037881	.039344	.962803	[.336]
B13	-.472104E-02	.266241E-02	-1.77322	[.076]
D13	.972878E-03	.339201E-02	.286815	[.774]
G1414	-.319471	.835439E-02	-38.2399	[.000]
A14	-1.03703	.105595	-9.82077	[.000]
B14	.913131E-02	.705578E-02	1.29416	[.196]
D14	-.737392E-02	.927102E-02	-.795373	[.426]
G1515	-.085098	.323643E-02	-26.2936	[.000]
A15	-.043149	.039866	-1.08234	[.279]
B15	-.543071E-02	.266446E-02	-2.03820	[.042]
D15	-.139978E-02	.343911E-02	-.407019	[.684]
G1616	-.132284	.020814	-6.35551	[.000]
A16	-.154843	.065617	-2.35981	[.018]
B16	-.556449E-02	.157562E-02	-3.53161	[.000]
D16	.143056E-02	.211996E-02	.674803	[.500]
G1717	-.093683	.186850E-02	-50.1382	[.000]
A17	.024148	.025847	.934269	[.350]
B17	-.980656E-02	.170094E-02	-5.76538	[.000]
D17	.223507E-02	.213352E-02	1.04760	[.295]
G1818	-.097134	.539003E-02	-18.0210	[.000]
A18	-.092381	.043115	-2.14269	[.032]
B18	-.248057E-02	.244317E-02	-1.01531	[.310]
D18	-.436842E-02	.326925E-02	-1.33622	[.181]
G1919	-.154145	.020877	-7.38351	[.000]
A19	-.218702	.110700	-1.97562	[.048]
B19	-.594269E-02	.570935E-02	-1.04087	[.298]
D19	-.022244	.762789E-02	-2.91612	[.004]
G2020	-.096648	.260090E-02	-37.1593	[.000]
A20	-.098186	.022877	-4.29186	[.000]
B20	-.298092E-02	.134710E-02	-2.21284	[.027]
D20	-.187249E-03	.177096E-02	-.105733	[.916]
G2121	-.048246	.210195E-02	-22.9532	[.000]
A21	.087734	.022082	3.97310	[.000]
B21	-.538307E-02	.132945E-02	-4.04911	[.000]
D21	-.170038E-02	.178587E-02	-.952126	[.341]
G2222	-.014068	.592195E-02	-2.37558	[.018]

A22	.068013	.060938	1.11611	[.264]
B22	-.120163E-02	.248100E-02	-.484334	[.628]
D22	-.394319E-02	.338472E-02	-1.16500	[.244]
G2323	-.041003	.667316E-02	-6.14446	[.000]
A23	.230371	.047412	4.85890	[.000]
B23	.202917E-02	.296995E-02	.683234	[.494]
D23	.314299E-02	.392837E-02	.800073	[.424]
G2424	-.025404	.390258E-02	-6.50948	[.000]
A24	.117317	.041115	2.85340	[.004]
B24	-.279135E-02	.244709E-02	-1.14068	[.254]
D24	-.168793E-02	.328594E-02	-.513684	[.607]
G2525	-.065590	.166271E-02	-39.4475	[.000]
A25	.031190	.021081	1.47952	[.139]
B25	-.232173E-02	.126502E-02	-1.83533	[.066]
D25	-.124768E-02	.169520E-02	-.736006	[.462]
G2626	-.119494	.521205E-02	-22.9264	[.000]
A26	-.270245	.024352	-11.0976	[.000]
B26	-.235250E-02	.925071E-03	-2.54305	[.011]
D26	.139157E-02	.122833E-02	1.13290	[.257]
G2727	-.047116	.208113E-02	-22.6399	[.000]
A27	.014337	.022105	.648563	[.517]
B27	-.459850E-02	.140959E-02	-3.26230	[.001]
D27	-.174714E-02	.177424E-02	-.984728	[.325]
G2828	-.034625	.324867E-02	-10.6582	[.000]
A28	.066393	.033881	1.95959	[.050]
B28	-.196803E-02	.207041E-02	-.950550	[.342]
D28	-.768110E-03	.278500E-02	-.275802	[.783]
G2929	-.040202	.244983E-02	-16.4101	[.000]
A29	.053409	.025667	2.08084	[.037]
B29	-.258812E-02	.171304E-02	-1.51083	[.131]
D29	.151757E-02	.217269E-02	.698476	[.485]
G3030	-.051741	.180839E-02	-28.6117	[.000]
A30	.058874	.015878	3.70776	[.000]
B30	-.301954E-02	.880133E-03	-3.43077	[.001]
D30	.849657E-03	.116269E-02	.730765	[.465]
G3131	-.038727	.314683E-02	-12.3066	[.000]
A31	.054554	.015637	3.48875	[.000]
B31	-.969130E-03	.833903E-03	-1.16216	[.245]
D31	-.519713E-03	.106064E-02	-.490000	[.624]
G3232	-.038765	.156165E-02	-24.8230	[.000]
A32	.063889	.017429	3.66563	[.000]
B32	-.154760E-02	.101485E-02	-1.52496	[.127]
D32	-.126381E-02	.135425E-02	-.933214	[.351]
G3333	-.068868	.310380E-02	-22.1884	[.000]
A33	-.046593	.021027	-2.21581	[.027]
B33	-.184152E-02	.104977E-02	-1.75421	[.079]
D33	-.149859E-02	.140411E-02	-1.06728	[.286]
G3434	-.099596	.566008E-02	-17.5962	[.000]
A34	-.113453	.023808	-4.76542	[.000]
B34	-.320129E-02	.108482E-02	-2.95098	[.003]
D34	.254060E-02	.145060E-02	1.75141	[.080]
G3535	-.075363	.261831E-02	-28.7830	[.000]
A35	-.048293	.019257	-2.50789	[.012]
B35	-.283822E-02	.993608E-03	-2.85647	[.004]
D35	.140873E-03	.132086E-02	.106652	[.915]
G3636	-.050613	.233722E-02	-21.6552	[.000]
A36	.404040E-02	.024647	.163929	[.870]
B36	-.102675E-02	.142641E-02	-.719816	[.472]
D36	-.142777E-02	.188982E-02	-.755510	[.450]
G3737	-.021770	.155437E-02	-14.0059	[.000]
A37	.090795	.021949	4.13662	[.000]

B37	-.226970E-02	.131334E-02	-1.72818	[.084]
D37	-.739493E-03	.175686E-02	-.420916	[.674]
G3838	-.075482	.015648	-4.82361	[.000]
A38	-.070629	.019848	-3.55847	[.000]
B38	-.803407E-03	.110363E-02	-.727966	[.467]
D38	.140471E-02	.144604E-02	.971413	[.331]
G3939	-.102003	.441647E-02	-23.0961	[.000]
A39	-.117419	.018738	-6.26631	[.000]
B39	-.175224E-02	.871142E-03	-2.01142	[.044]
D39	.212180E-02	.115315E-02	1.84000	[.066]
G4040	-.123128	.485850E-02	-25.3427	[.000]
A40	-.324517	.022910	-14.1649	[.000]
B40	-.440238E-03	.850634E-03	-.517541	[.605]
D40	.338470E-03	.111995E-02	.302218	[.762]
G4141	-.046165	.015616	-2.95634	[.003]
A41	.023339	.015660	1.49037	[.136]
B41	-.210598E-02	.831421E-03	-2.53299	[.011]
D41	.103451E-02	.104050E-02	.994252	[.320]
G4242	-.093572	.369079E-02	-25.3528	[.000]
A42	-.125430	.016576	-7.56713	[.000]
B42	-.897615E-03	.769832E-03	-1.16599	[.244]
D42	.229258E-02	.101340E-02	2.26227	[.024]
G4343	-.078903	.370815E-02	-21.2782	[.000]
A43	-.100078	.017876	-5.59854	[.000]
B43	-.127802E-02	.820082E-03	-1.55840	[.119]
D43	.243538E-02	.108544E-02	2.24367	[.025]
G4444	-.098768	.667269E-02	-14.8019	[.000]
A44	-.207095	.032038	-6.46408	[.000]
B44	.346295E-02	.132874E-02	2.60619	[.009]
D44	.131962E-02	.170471E-02	.774103	[.439]

SPECIFICATION #7

L0 = coefficient for WF*NSSJD*lnPj
L1 = coefficient for WF*NSSJD*SUJD*lnPj
L2 = coefficient for WF*(1 – NSSJD)*lnPj
L3 = coefficient for WF*(1 – NSSJD)*SUJD*lnPj
L4 = coefficient for (1 – WF)*NSSJD*lnPj
L5 = coefficient for (1 – WF)*NSSJD*SUJD*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.020929	.150728E-02	-13.8850	[.000]
L1	.065515	.010107	6.48184	[.000]
L2	.155979E-02	.153969E-03	10.1306	[.000]
L3	.044494	.375233E-02	11.8577	[.000]
L4	-.310806E-02	.757418E-03	-4.10350	[.000]
L5	.014994	.377221E-02	3.97478	[.000]
L6	.805583E-03	.736912E-04	10.9319	[.000]
L7	-.567126E-02	.103101E-02	-5.50066	[.000]
G11	-.332351	.899027E-02	-36.9679	[.000]
A1	-.085740	.137746	-.622452	[.534]
B1	-.052162	.903834E-02	-5.77122	[.000]
D1	.013482	.011980	1.12536	[.260]
RHO	.822299	.011149	73.7550	[.000]
G22	-.272652	.756725E-02	-36.0305	[.000]
A2	-.050283	.068409	-.735025	[.462]

B2	-.034807	.423657E-02	-8.21583	[.000]
D2	-.512871E-02	.568726E-02	-.901790	[.367]
G33	-.369105	.908172E-02	-40.6426	[.000]
A3	-.221332	.098933	-2.23718	[.025]
B3	-.053566	.690655E-02	-7.75581	[.000]
D3	.013080	.859737E-02	1.52139	[.128]
G44	-.136584	.775680E-02	-17.6083	[.000]
A4	.043271	.073023	.592572	[.553]
B4	-.016953	.504814E-02	-3.35832	[.001]
D4	.156418E-02	.634800E-02	.246405	[.805]
G55	-.254444	.025146	-10.1187	[.000]
A5	-.391946	.081734	-4.79538	[.000]
B5	-.014245	.241184E-02	-5.90618	[.000]
D5	-.724207E-02	.322864E-02	-2.24307	[.025]
G66	-.089471	.407421E-02	-21.9602	[.000]
A6	-.948246E-02	.045596	-.207965	[.835]
B6	-.800520E-02	.276644E-02	-2.89368	[.004]
D6	-.552197E-02	.367160E-02	-1.50397	[.133]
G77	-.142620	.572245E-02	-24.9229	[.000]
A7	-.141050	.043904	-3.21268	[.001]
B7	-.011537	.250278E-02	-4.60950	[.000]
D7	-.135388E-02	.335361E-02	-.403709	[.686]
G88	-.374165	.822347E-02	-45.4997	[.000]
A8	-.819587	.162921	-5.03058	[.000]
B8	-.014573	.010701	-1.36182	[.173]
D8	.011057	.014154	.781224	[.435]
G99	-.104322	.257434E-02	-40.5237	[.000]
A9	.751735E-02	.025583	.293847	[.769]
B9	-.910825E-02	.155141E-02	-5.87096	[.000]
D9	-.238284E-02	.207082E-02	-1.15068	[.250]
G1010	-.097000	.361433E-02	-26.8377	[.000]
A10	-.052630	.032887	-1.60035	[.110]
B10	-.755005E-02	.201962E-02	-3.73835	[.000]
D10	-.419438E-02	.270517E-02	-1.55050	[.121]
G1111	-.079308	.309224E-02	-25.6473	[.000]
A11	.490156E-02	.031673	.154753	[.877]
B11	-.929347E-02	.213226E-02	-4.35851	[.000]
D11	-.967681E-03	.270017E-02	-.358378	[.720]
G1212	-.106747	.401065E-02	-26.6159	[.000]
A12	-.018341	.048659	-.376928	[.706]
B12	-.012310	.293962E-02	-4.18777	[.000]
D12	.110809E-02	.393039E-02	.281928	[.778]
G1313	-.066831	.336162E-02	-19.8806	[.000]
A13	.017866	.039134	.456535	[.648]
B13	-.470047E-02	.267463E-02	-1.75743	[.079]
D13	.104327E-02	.336111E-02	.310394	[.756]
G1414	-.315351	.782039E-02	-40.3242	[.000]
A14	-1.02023	.105210	-9.69712	[.000]
B14	.010430	.701171E-02	1.48748	[.137]
D14	-.756328E-02	.916469E-02	-.825263	[.409]
G1515	-.082100	.347088E-02	-23.6540	[.000]
A15	-.043413	.039787	-1.09112	[.275]
B15	-.511969E-02	.268731E-02	-1.90514	[.057]
D15	-.118774E-02	.341809E-02	-.347487	[.728]
G1616	-.137151	.020008	-6.85472	[.000]
A16	-.172897	.063424	-2.72605	[.006]
B16	-.580357E-02	.158849E-02	-3.65352	[.000]
D16	.140667E-02	.211954E-02	.663664	[.507]
G1717	-.073455	.207262E-02	-35.4409	[.000]
A17	.018344	.027025	.678787	[.497]
B17	-.875193E-02	.176352E-02	-4.96277	[.000]

D17	.244349E-02	.222381E-02	1.09879	[.272]
G1818	-.068650	.458822E-02	-14.9623	[.000]
A18	-.078090	.037918	-2.05944	[.039]
B18	-.261983E-02	.217386E-02	-1.20515	[.228]
D18	-.453436E-02	.288425E-02	-1.57211	[.116]
G1919	-.142846	.021722	-6.57620	[.000]
A19	-.188083	.112316	-1.67458	[.094]
B19	-.304896E-02	.569735E-02	-.535155	[.593]
D19	-.021382	.755797E-02	-2.82901	[.005]
G2020	-.095054	.248476E-02	-38.2550	[.000]
A20	-.081578	.023673	-3.44610	[.001]
B20	-.549080E-02	.141571E-02	-3.87847	[.000]
D20	-.958928E-03	.185681E-02	-.516437	[.606]
G2121	-.045760	.232069E-02	-19.7185	[.000]
A21	.078109	.021839	3.57663	[.000]
B21	-.559828E-02	.132567E-02	-4.22298	[.000]
D21	-.192224E-02	.176787E-02	-1.08732	[.277]
G2222	-.014455	.611288E-02	-2.36475	[.018]
A22	.061311	.061030	1.00460	[.315]
B22	-.128603E-02	.251078E-02	-.512202	[.609]
D22	-.417160E-02	.339705E-02	-1.22801	[.219]
G2323	-.040479	.632475E-02	-6.40005	[.000]
A23	.197148	.052834	3.73144	[.000]
B23	.380050E-03	.337048E-02	.112758	[.910]
D23	.510572E-02	.445124E-02	1.14703	[.251]
G2424	-.019926	.252011E-02	-7.90689	[.000]
A24	.056193	.033006	1.70249	[.089]
B24	-.214709E-02	.199614E-02	-1.07562	[.282]
D24	-.137334E-02	.265600E-02	-.517071	[.605]
G2525	-.068992	.165065E-02	-41.7966	[.000]
A25	.016923	.020773	.814665	[.415]
B25	-.265178E-02	.124503E-02	-2.12989	[.033]
D25	-.163263E-02	.165449E-02	-.986783	[.324]
G2626	-.119837	.556467E-02	-21.5353	[.000]
A26	-.292609	.025187	-11.6174	[.000]
B26	-.245578E-02	.921012E-03	-2.66640	[.008]
D26	.109946E-02	.121382E-02	.905786	[.365]
G2727	-.048910	.209169E-02	-23.3833	[.000]
A27	.015460	.022309	.692998	[.488]
B27	-.457768E-02	.147358E-02	-3.10651	[.002]
D27	-.163809E-02	.183113E-02	-.894582	[.371]
G2828	-.033224	.306525E-02	-10.8389	[.000]
A28	.059830	.033839	1.76810	[.077]
B28	-.225207E-02	.207745E-02	-1.08406	[.278]
D28	-.943805E-03	.277269E-02	-.340393	[.734]
G2929	-.037301	.232064E-02	-16.0735	[.000]
A29	.036503	.025370	1.43879	[.150]
B29	-.244273E-02	.168830E-02	-1.44685	[.148]
D29	.160022E-02	.213389E-02	.749910	[.453]
G3030	-.047372	.171353E-02	-27.6457	[.000]
A30	.045697	.014859	3.07539	[.002]
B30	-.319176E-02	.823103E-03	-3.87772	[.000]
D30	.272147E-03	.107747E-02	.252580	[.801]
G3131	-.022738	.206565E-02	-11.0078	[.000]
A31	.060381	.013510	4.46945	[.000]
B31	-.243663E-02	.695969E-03	-3.50106	[.000]
D31	-.571482E-03	.889234E-03	-.642668	[.520]
G3232	-.037942	.184273E-02	-20.5901	[.000]
A32	.059904	.017519	3.41945	[.001]
B32	-.184096E-02	.103445E-02	-1.77965	[.075]
D32	-.154059E-02	.137156E-02	-1.12324	[.261]

G3333	-.068415	.303612E-02	-22.5338	[.000]
A33	-.059350	.020631	-2.87678	[.004]
B33	-.221656E-02	.105733E-02	-2.09638	[.036]
D33	-.129954E-02	.140229E-02	-.926726	[.354]
G3434	-.099351	.542825E-02	-18.3027	[.000]
A34	-.129037	.023306	-5.53672	[.000]
B34	-.347122E-02	.110780E-02	-3.13343	[.002]
D34	.270727E-02	.147021E-02	1.84142	[.066]
G3535	-.072345	.317506E-02	-22.7852	[.000]
A35	-.039348	.020582	-1.91173	[.056]
B35	-.292678E-02	.103370E-02	-2.83136	[.005]
D35	.100791E-03	.136964E-02	.073589	[.941]
G3636	-.034504	.258077E-02	-13.3697	[.000]
A36	-.014466	.027252	-.530810	[.596]
B36	-.980955E-03	.158279E-02	-.619762	[.535]
D36	-.135128E-02	.209244E-02	-.645794	[.518]
G3737	-.020641	.148121E-02	-13.9351	[.000]
A37	.096682	.021908	4.41303	[.000]
B37	-.280696E-02	.132827E-02	-2.11324	[.035]
D37	-.435679E-03	.176183E-02	-.247287	[.805]
G3838	-.112952	.831028E-02	-13.5919	[.000]
A38	-.077336	.019899	-3.88638	[.000]
B38	-.101463E-02	.112980E-02	-.898061	[.369]
D38	.104954E-02	.145660E-02	.720544	[.471]
G3939	-.102674	.392276E-02	-26.1739	[.000]
A39	-.128709	.018520	-6.94962	[.000]
B39	-.200413E-02	.899280E-03	-2.22860	[.026]
D39	.222945E-02	.118449E-02	1.88220	[.060]
G4040	-.121357	.489563E-02	-24.7888	[.000]
A40	-.328603	.023063	-14.2484	[.000]
B40	-.444663E-03	.849497E-03	-.523443	[.601]
D40	.164994E-03	.111248E-02	.148312	[.882]
G4141	-.086472	.856788E-02	-10.0926	[.000]
A41	-.014709	.018216	-.807476	[.419]
B41	.824973E-03	.989087E-03	.834075	[.404]
D41	.131433E-02	.125296E-02	1.04898	[.294]
G4242	-.098983	.364691E-02	-27.1416	[.000]
A42	-.134616	.016864	-7.98250	[.000]
B42	-.112402E-02	.791600E-03	-1.41993	[.156]
D42	.238824E-02	.103769E-02	2.30149	[.021]
G4343	-.076965	.354833E-02	-21.6906	[.000]
A43	-.132958	.017911	-7.42327	[.000]
B43	-.150623E-02	.855997E-03	-1.75962	[.078]
D43	.257704E-02	.112562E-02	2.28944	[.022]
G4444	-.099949	.746589E-02	-13.3874	[.000]
A44	-.219144	.034906	-6.27811	[.000]
B44	.486856E-02	.138888E-02	3.50538	[.000]
D44	.149021E-02	.178940E-02	.832797	[.405]

SPECIFICATION #8

L0 = coefficient for WF*NSSJD*lnPj
L1 = coefficient for WF*NSSJD*SUJD*lnPj
L2 = coefficient for WF*NSSJD*(SUJD^2)*lnPj
L3 = coefficient for WF*(1 – NSSJD)*lnPj
L4 = coefficient for WF*(1 – NSSJD)*SUJD*lnPj
L5 = coefficient for WF*(1 – NSSJD)*(SUJD^2)*lnPj

L6 = coefficient for (1 – WF)*NSSJD*lnPj
L7 = coefficient for (1 – WF)*NSSJD*SUJD*lnPj
L8 = coefficient for (1 – WF)*NSSJD*(SUJD^2)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.055887	.254134E-02	-21.9911	[.000]
L1	.410332	.026137	15.6990	[.000]
L2	-.552588	.044754	-12.3472	[.000]
L3	-.617506E-03	.193478E-03	-3.19162	[.001]
L4	.162266	.892108E-02	18.1891	[.000]
L5	-.449807	.034205	-13.1502	[.000]
L6	-.010567	.154576E-02	-6.83625	[.000]
L7	.100889	.015463	6.52468	[.000]
L8	-.122992	.020034	-6.13925	[.000]
L9	.837630E-03	.795654E-04	10.5276	[.000]
L10	.121798E-02	.227269E-02	.535918	[.592]
L11	-.014999	.462023E-02	-3.24640	[.001]
G11	-.328313	.933805E-02	-35.1586	[.000]
A1	-.045867	.137023	-.334739	[.738]
B1	-.049577	.899987E-02	-5.50864	[.000]
D1	.013348	.011884	1.12319	[.261]
RHO	.819350	.010596	77.3261	[.000]
G22	-.280136	.762867E-02	-36.7214	[.000]
A2	-.056362	.068296	-.825256	[.409]
B2	-.034586	.423067E-02	-8.17507	[.000]
D2	-.535962E-02	.566363E-02	-.946323	[.344]
G33	-.359305	.879319E-02	-40.8617	[.000]
A3	-.197059	.099978	-1.97102	[.049]
B3	-.050214	.694203E-02	-7.23336	[.000]
D3	.012951	.866361E-02	1.49489	[.135]
G44	-.139185	.701168E-02	-19.8504	[.000]
A4	.045185	.071892	.628515	[.530]
B4	-.015252	.491811E-02	-3.10114	[.002]
D4	.254718E-02	.622745E-02	.409024	[.683]
G55	-.256392	.025305	-10.1320	[.000]
A5	-.426091	.082615	-5.15753	[.000]
B5	-.014150	.246928E-02	-5.73060	[.000]
D5	-.709151E-02	.329639E-02	-2.15129	[.031]
G66	-.073327	.326533E-02	-22.4563	[.000]
A6	-.019828	.043792	-.452767	[.651]
B6	-.758338E-02	.267329E-02	-2.83673	[.005]
D6	-.534319E-02	.354334E-02	-1.50796	[.132]
G77	-.142032	.610681E-02	-23.2580	[.000]
A7	-.128308	.045597	-2.81394	[.005]
B7	-.011174	.258311E-02	-4.32577	[.000]
D7	-.148622E-02	.345309E-02	-.430403	[.667]
G88	-.363043	.775058E-02	-46.8408	[.000]
A8	-.777111	.161660	-4.80707	[.000]
B8	-.010469	.010601	-.987494	[.323]
D8	.011199	.013998	.800033	[.424]
G99	-.117077	.293893E-02	-39.8366	[.000]
A9	.010820	.025988	.416351	[.677]
B9	-.863296E-02	.157383E-02	-5.48533	[.000]
D9	-.232218E-02	.209649E-02	-1.10765	[.268]
G1010	-.104777	.413557E-02	-25.3355	[.000]
A10	-.060251	.034801	-1.73130	[.083]
B10	-.724405E-02	.213134E-02	-3.39882	[.001]
D10	-.408462E-02	.284920E-02	-1.43360	[.152]
G1111	-.074035	.311280E-02	-23.7842	[.000]
A11	.021347	.032015	.666796	[.505]

B11	-.875678E-02	.214500E-02	-4.08241	[.000]
D11	-.645012E-03	.272335E-02	-.236845	[.813]
G1212	-.105783	.419827E-02	-25.1968	[.000]
A12	.037549	.048844	.768755	[.442]
B12	-.012230	.292495E-02	-4.18141	[.000]
D12	.174558E-02	.389857E-02	.447749	[.654]
G1313	-.070580	.330737E-02	-21.3401	[.000]
A13	.067841	.040281	1.68421	[.092]
B13	-.361603E-02	.272444E-02	-1.32725	[.184]
D13	.183504E-02	.344995E-02	.531904	[.595]
G1414	-.317865	.690702E-02	-46.0206	[.000]
A14	-1.00693	.105137	-9.57728	[.000]
B14	.013711	.697669E-02	1.96530	[.049]
D14	-.650604E-02	.913362E-02	-.712317	[.476]
G1515	-.078648	.328080E-02	-23.9723	[.000]
A15	-.041137	.039841	-1.03252	[.302]
B15	-.477052E-02	.267230E-02	-1.78517	[.074]
D15	-.113579E-02	.340983E-02	-.333092	[.739]
G1616	-.137258	.019964	-6.87524	[.000]
A16	-.168051	.063340	-2.65314	[.008]
B16	-.545832E-02	.161284E-02	-3.38430	[.001]
D16	.127190E-02	.214676E-02	.592475	[.554]
G1717	-.068110	.217750E-02	-31.2791	[.000]
A17	.065749	.028452	2.31089	[.021]
B17	-.628192E-02	.188237E-02	-3.33724	[.001]
D17	.213890E-02	.236391E-02	.904812	[.366]
G1818	-.036986	.376782E-02	-9.81630	[.000]
A18	-.037989	.034022	-1.11662	[.264]
B18	-.207191E-02	.199181E-02	-1.04021	[.298]
D18	-.413473E-02	.263725E-02	-1.56782	[.117]
G1919	-.111798	.021711	-5.14939	[.000]
A19	-.058665	.112432	-.521780	[.602]
B19	-.294476E-03	.571469E-02	-.051530	[.959]
D19	-.020957	.753960E-02	-2.77965	[.005]
G2020	-.097172	.242415E-02	-40.0850	[.000]
A20	-.075457	.023485	-3.21300	[.001]
B20	-.273641E-02	.141779E-02	-1.93006	[.054]
D20	.212967E-03	.183935E-02	.115784	[.908]
G2121	-.044257	.241269E-02	-18.3433	[.000]
A21	.080757	.022016	3.66807	[.000]
B21	-.529084E-02	.133330E-02	-3.96824	[.000]
D21	-.181987E-02	.177380E-02	-1.02597	[.305]
G2222	-.015087	.659734E-02	-2.28676	[.022]
A22	.106422	.065382	1.62771	[.104]
B22	-.786521E-03	.263785E-02	-.298168	[.766]
D22	-.397697E-02	.356145E-02	-1.11667	[.264]
G2323	-.041076	.538857E-02	-7.62275	[.000]
A23	.243517	.044709	5.44672	[.000]
B23	-.108431E-03	.285230E-02	-.038015	[.970]
D23	.392172E-02	.371922E-02	1.05445	[.292]
G2424	-.016010	.196008E-02	-8.16798	[.000]
A24	.043651	.029714	1.46905	[.142]
B24	-.106875E-02	.180296E-02	-.592775	[.553]
D24	-.121590E-02	.239018E-02	-.508708	[.611]
G2525	-.082056	.178064E-02	-46.0824	[.000]
A25	.037997	.021486	1.76841	[.077]
B25	-.282330E-02	.128178E-02	-2.20265	[.028]
D25	-.186778E-02	.169950E-02	-1.09902	[.272]
G2626	-.118880	.609373E-02	-19.5086	[.000]
A26	-.283015	.026676	-10.6095	[.000]
B26	-.200840E-02	.924449E-03	-2.17254	[.030]

D26	.131881E-02	.121580E-02	1.08472	[.278]
G2727	-.050348	.216454E-02	-23.2605	[.000]
A27	-.682030E-02	.022039	-.309469	[.757]
B27	-.408402E-02	.143341E-02	-2.84916	[.004]
D27	-.178209E-02	.176061E-02	-1.01220	[.311]
G2828	-.031450	.288067E-02	-10.9177	[.000]
A28	.081215	.033616	2.41594	[.016]
B28	-.219094E-02	.206508E-02	-1.06095	[.289]
D28	-.687664E-03	.274858E-02	-.250189	[.802]
G2929	-.038376	.244632E-02	-15.6871	[.000]
A29	.041353	.025511	1.62099	[.105]
B29	-.226374E-02	.170848E-02	-1.32500	[.185]
D29	.192386E-02	.214812E-02	.895603	[.370]
G3030	-.048113	.180337E-02	-26.6797	[.000]
A30	.057544	.015820	3.63740	[.000]
B30	-.294127E-02	.888450E-03	-3.31056	[.001]
D30	.325589E-03	.116453E-02	.279588	[.780]
G3131	-.023033	.208791E-02	-11.0314	[.000]
A31	.057885	.013483	4.29319	[.000]
B31	-.181483E-02	.711168E-03	-2.55190	[.011]
D31	-.256148E-03	.902600E-03	-.283789	[.777]
G3232	-.035905	.189097E-02	-18.9877	[.000]
A32	.062026	.017600	3.52416	[.000]
B32	-.149508E-02	.104276E-02	-1.43377	[.152]
D32	-.138640E-02	.137944E-02	-1.00505	[.315]
G3333	-.069864	.364785E-02	-19.1522	[.000]
A33	-.078023	.022994	-3.39312	[.001]
B33	-.188226E-02	.116033E-02	-1.62218	[.105]
D33	-.162358E-02	.153955E-02	-1.05458	[.292]
G3434	-.103470	.541301E-02	-19.1150	[.000]
A34	-.126100	.022565	-5.58819	[.000]
B34	-.342420E-02	.109964E-02	-3.11392	[.002]
D34	.233022E-02	.145460E-02	1.60197	[.109]
G3535	-.067139	.440773E-02	-15.2320	[.000]
A35	-.711057E-02	.023816	-.298566	[.765]
B35	-.267311E-02	.111900E-02	-2.38883	[.017]
D35	.261205E-03	.148468E-02	.175934	[.860]
G3636	-.025788	.274682E-02	-9.38814	[.000]
A36	-.897477E-02	.029029	-.309169	[.757]
B36	-.212552E-03	.169013E-02	-.125761	[.900]
D36	-.132245E-02	.222393E-02	-.594645	[.552]
G3737	-.018910	.148314E-02	-12.7498	[.000]
A37	.119295	.022009	5.42023	[.000]
B37	-.236256E-02	.133564E-02	-1.76886	[.077]
D37	-.408105E-03	.176569E-02	-.231131	[.817]
G3838	.080654	.020868	3.86503	[.000]
A38	-.063817	.018781	-3.39790	[.001]
B38	-.122091E-02	.107137E-02	-1.13958	[.254]
D38	.120885E-02	.135667E-02	.891046	[.373]
G3939	-.091245	.396838E-02	-22.9930	[.000]
A39	-.113085	.018030	-6.27213	[.000]
B39	-.247723E-02	.872009E-03	-2.84083	[.004]
D39	.198203E-02	.114363E-02	1.73310	[.083]
G4040	-.124162	.515507E-02	-24.0854	[.000]
A40	-.296519	.024784	-11.9642	[.000]
B40	-.257642E-03	.878138E-03	-.293396	[.769]
D40	.749749E-03	.115106E-02	.651357	[.515]
G4141	.110010	.020940	5.25359	[.000]
A41	.010040	.016835	.596418	[.551]
B41	-.690148E-03	.920172E-03	-.750021	[.453]
D41	.787841E-03	.114694E-02	.686905	[.492]

G4242	-.093106	.403621E-02	-23.0676	[.000]
A42	-.116846	.016425	-7.11392	[.000]
B42	-.158681E-02	.769069E-03	-2.06328	[.039]
D42	.208203E-02	.100365E-02	2.07446	[.038]
G4343	-.077159	.362977E-02	-21.2573	[.000]
A43	-.158236	.018378	-8.60995	[.000]
B43	-.119239E-02	.880021E-03	-1.35496	[.175]
D43	.253844E-02	.115567E-02	2.19652	[.028]
G4444	-.106390	.851070E-02	-12.5007	[.000]
A44	-.221954	.039837	-5.57158	[.000]
B44	.889113E-02	.162276E-02	5.47900	[.000]
D44	.170727E-02	.206973E-02	.824874	[.409]

SPECIFICATION #9

L0 = coefficient for   WF*NSSJD*lnPj
L1 = coefficient for   WF*NSSJD*SUJD*lnPj
L2 = coefficient for   WF*NSSJD*(SUJD^2)*lnPj
L3 = coefficient for   WF*NSSJD*(SUJD^3)*lnPj
L4 = coefficient for   WF*(1 – NSSJD)*lnPj
L5 = coefficient for   WF*(1 – NSSJD)*SUJD*lnPj
L6 = coefficient for   WF*(1 – NSSJD)*(SUJD^2)*lnPj
L7 = coefficient for   WF*(1 – NSSJD)*(SUJD^3)*lnPj
L8 = coefficient for   (1 – WF)*NSSJD*lnPj
L9 = coefficient for   (1 – WF)*NSSJD*SUJD*lnPj
L10 = coefficient for   (1 – WF)*NSSJD*(SUJD^2)*lnPj
L11 = coefficient for   (1 – WF)*NSSJD*(SUJD^3)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.057983	.368678E-02	-15.7272	[.000]
L1	.463401	.049679	9.32796	[.000]
L2	-.894292	.155820	-5.73925	[.000]
L3	.471464	.125076	3.76941	[.000]
L4	.188827E-02	.213875E-03	8.82885	[.000]
L5	.345258E-02	.011733	.294274	[.769]
L6	.987775	.145211	6.80233	[.000]
L7	-3.17020	.376119	-8.42872	[.000]
L8	-.336724E-02	.233941E-02	-1.43936	[.150]
L9	-.982993E-02	.036507	-.269262	[.788]
L10	.303567	.142549	2.12955	[.033]
L11	-.415084	.137263	-3.02400	[.002]
L12	.685031E-03	.969828E-04	7.06343	[.000]
L13	.011399	.473436E-02	2.40768	[.016]
L14	-.107712	.027658	-3.89449	[.000]
L15	.117681	.033500	3.51281	[.000]
G11	-.327243	.868480E-02	-37.6799	[.000]
A1	-.042604	.139833	-.304680	[.761]
B1	-.050185	.916853E-02	-5.47359	[.000]
D1	.012947	.012100	1.06997	[.285]
RHO	.816866	.010151	80.4707	[.000]
G22	-.278348	.794355E-02	-35.0408	[.000]
A2	-.049273	.068661	-.717624	[.473]
B2	-.034757	.424251E-02	-8.19261	[.000]
D2	-.539034E-02	.566638E-02	-.951285	[.341]
G33	-.358669	.949340E-02	-37.7809	[.000]

A3	-.215997	.100260	-2.15438	[.031]
B3	-.050648	.703247E-02	-7.20200	[.000]
D3	.012814	.866331E-02	1.47906	[.139]
G44	-.141549	.725777E-02	-19.5031	[.000]
A4	.060483	.072902	.829649	[.407]
B4	-.015013	.502048E-02	-2.99043	[.003]
D4	.315872E-02	.628557E-02	.502536	[.615]
G55	-.249316	.023913	-10.4260	[.000]
A5	-.406904	.079308	-5.13066	[.000]
B5	-.014321	.248258E-02	-5.76852	[.000]
D5	-.709096E-02	.330497E-02	-2.14554	[.032]
G66	-.076402	.353473E-02	-21.6148	[.000]
A6	-.026203	.044301	-.591477	[.554]
B6	-.765992E-02	.268168E-02	-2.85638	[.004]
D6	-.535783E-02	.354213E-02	-1.51260	[.130]
G77	-.141819	.614177E-02	-23.0909	[.000]
A7	-.126181	.044441	-2.83931	[.005]
B7	-.011141	.249502E-02	-4.46544	[.000]
D7	-.135539E-02	.332681E-02	-.407413	[.684]
G88	-.367025	.756967E-02	-48.4862	[.000]
A8	-.792789	.158674	-4.99632	[.000]
B8	-.012234	.010391	-1.17744	[.239]
D8	.010457	.013690	.763828	[.445]
G99	-.108902	.280355E-02	-38.8443	[.000]
A9	.010784	.026702	.403875	[.686]
B9	-.879607E-02	.162620E-02	-5.40897	[.000]
D9	-.224930E-02	.216025E-02	-1.04122	[.298]
G1010	-.097126	.411579E-02	-23.5985	[.000]
A10	-.054755	.035655	-1.53570	[.125]
B10	-.743706E-02	.218126E-02	-3.40952	[.001]
D10	-.404192E-02	.290849E-02	-1.38970	[.165]
G1111	-.075676	.317176E-02	-23.8592	[.000]
A11	.013520	.032006	.422424	[.673]
B11	-.845651E-02	.215300E-02	-3.92778	[.000]
D11	-.471875E-03	.270897E-02	-.174190	[.862]
G1212	-.106292	.379157E-02	-28.0339	[.000]
A12	.040075	.048549	.825464	[.409]
B12	-.012114	.291152E-02	-4.16059	[.000]
D12	.177497E-02	.387125E-02	.458500	[.647]
G1313	-.072596	.349492E-02	-20.7719	[.000]
A13	.054033	.040542	1.33278	[.183]
B13	-.337935E-02	.276189E-02	-1.22356	[.221]
D13	.171127E-02	.345774E-02	.494910	[.621]
G1414	-.315268	.688084E-02	-45.8183	[.000]
A14	-1.02579	.105801	-9.69553	[.000]
B14	.013316	.702097E-02	1.89654	[.058]
D14	-.683465E-02	.916849E-02	-.745450	[.456]
G1515	-.076523	.341359E-02	-22.4171	[.000]
A15	-.044234	.039986	-1.10623	[.269]
B15	-.374386E-02	.269552E-02	-1.38892	[.165]
D15	-.802937E-03	.340457E-02	-.235841	[.814]
G1616	-.138145	.020696	-6.67511	[.000]
A16	-.167982	.065488	-2.56509	[.010]
B16	-.553134E-02	.159842E-02	-3.46051	[.001]
D16	.128807E-02	.212127E-02	.607218	[.544]
G1717	-.067854	.244358E-02	-27.7682	[.000]
A17	.042923	.029190	1.47048	[.141]
B17	-.685731E-02	.196061E-02	-3.49755	[.000]
D17	.207925E-02	.242601E-02	.857068	[.391]
G1818	-.039548	.415735E-02	-9.51283	[.000]
A18	-.036944	.034444	-1.07258	[.283]

B18	-.220562E-02	.199753E-02	-1.10417	[.270]
D18	-.409969E-02	.263719E-02	-1.55457	[.120]
G1919	-.119625	.021961	-5.44715	[.000]
A19	-.088275	.113560	-.777338	[.437]
B19	-.206031E-02	.578070E-02	-.356412	[.722]
D19	-.021590	.758611E-02	-2.84599	[.004]
G2020	-.097281	.243353E-02	-39.9751	[.000]
A20	-.088131	.022879	-3.85202	[.000]
B20	-.275872E-02	.139054E-02	-1.98393	[.047]
D20	.169648E-03	.178508E-02	.095037	[.924]
G2121	-.045469	.235477E-02	-19.3094	[.000]
A21	.084849	.022121	3.83574	[.000]
B21	-.543171E-02	.133051E-02	-4.08242	[.000]
D21	-.183744E-02	.176434E-02	-1.04143	[.298]
G2222	-.017833	.624939E-02	-2.85359	[.004]
A22	.087018	.063134	1.37829	[.168]
B22	-.114598E-02	.262886E-02	-.435922	[.663]
D22	-.429400E-02	.353564E-02	-1.21449	[.225]
G2323	-.041625	.560182E-02	-7.43065	[.000]
A23	.228231	.042416	5.38084	[.000]
B23	-.385643E-02	.272965E-02	-1.41279	[.158]
D23	.311575E-02	.351129E-02	.887353	[.375]
G2424	-.018262	.226520E-02	-8.06217	[.000]
A24	.042899	.031005	1.38362	[.166]
B24	-.119933E-02	.187224E-02	-.640584	[.522]
D24	-.137499E-02	.247521E-02	-.555504	[.579]
G2525	-.075720	.184318E-02	-41.0813	[.000]
A25	.039168	.021771	1.79914	[.072]
B25	-.280077E-02	.130081E-02	-2.15309	[.031]
D25	-.174213E-02	.171954E-02	-1.01314	[.311]
G2626	-.121820	.538080E-02	-22.6398	[.000]
A26	-.288236	.024663	-11.6869	[.000]
B26	-.228396E-02	.928506E-03	-2.45982	[.014]
D26	.135833E-02	.121709E-02	1.11605	[.264]
G2727	-.046323	.249683E-02	-18.5527	[.000]
A27	-.013447	.022951	-.585922	[.558]
B27	-.412301E-02	.147270E-02	-2.79962	[.005]
D27	-.215666E-02	.178360E-02	-1.20916	[.227]
G2828	-.033354	.296189E-02	-11.2611	[.000]
A28	.075013	.033581	2.23378	[.025]
B28	-.223822E-02	.206033E-02	-1.08634	[.277]
D28	-.763026E-03	.273426E-02	-.279061	[.780]
G2929	-.037370	.271299E-02	-13.7744	[.000]
A29	.050888	.025667	1.98258	[.047]
B29	-.229855E-02	.173360E-02	-1.32588	[.185]
D29	.189735E-02	.214733E-02	.883586	[.377]
G3030	-.040588	.160732E-02	-25.2518	[.000]
A30	.054929	.014885	3.69018	[.000]
B30	-.292264E-02	.828319E-03	-3.52840	[.000]
D30	.102879E-03	.107755E-02	.095475	[.924]
G3131	-.017136	.311537E-02	-5.50050	[.000]
A31	.088880	.015023	5.91610	[.000]
B31	-.313713E-02	.791821E-03	-3.96191	[.000]
D31	-.281209E-03	.968130E-03	-.290466	[.771]
G3232	-.036722	.181477E-02	-20.2349	[.000]
A32	.066230	.017662	3.74984	[.000]
B32	-.159492E-02	.103526E-02	-1.54060	[.123]
D32	-.139129E-02	.136442E-02	-1.01969	[.308]
G3333	-.068182	.308919E-02	-22.0711	[.000]
A33	-.043826	.020874	-2.09960	[.036]
B33	-.181570E-02	.104962E-02	-1.72986	[.084]

D33	-.131498E-02	.138354E-02	-.950449	[.342]
G3434	-.111384	.622964E-02	-17.8797	[.000]
A34	-.116460	.022959	-5.07250	[.000]
B34	-.309630E-02	.111549E-02	-2.77574	[.006]
D34	.264521E-02	.147043E-02	1.79893	[.072]
G3535	-.073862	.317787E-02	-23.2426	[.000]
A35	-.037743	.020602	-1.83203	[.067]
B35	-.286178E-02	.103744E-02	-2.75851	[.006]
D35	.222106E-03	.136492E-02	.162725	[.871]
G3636	-.028986	.287256E-02	-10.0907	[.000]
A36	-.989264E-02	.029671	-.333408	[.739]
B36	-.647102E-03	.172948E-02	-.374161	[.708]
D36	-.148589E-02	.226827E-02	-.655077	[.512]
G3737	-.021036	.161437E-02	-13.0307	[.000]
A37	.109069	.022171	4.91941	[.000]
B37	-.258122E-02	.133617E-02	-1.93180	[.053]
D37	-.527377E-03	.176020E-02	-.299613	[.764]
G3838	-.055223	.017296	-3.19286	[.001]
A38	-.072498	.019791	-3.66317	[.000]
B38	-.336548E-03	.115376E-02	-.291696	[.771]
D38	.140065E-02	.143936E-02	.973106	[.331]
G3939	-.086175	.443319E-02	-19.4387	[.000]
A39	-.122461	.018288	-6.69634	[.000]
B39	-.159726E-02	.890550E-03	-1.79356	[.073]
D39	.227346E-02	.116143E-02	1.95747	[.050]
G4040	-.124855	.461066E-02	-27.0797	[.000]
A40	-.305109	.023307	-13.0908	[.000]
B40	-.322906E-03	.872137E-03	-.370248	[.711]
D40	.658130E-03	.113939E-02	.577614	[.564]
G4141	-.020272	.017427	-1.16322	[.245]
A41	.319876E-02	.015954	.200495	[.841]
B41	-.396779E-03	.890701E-03	-.445468	[.656]
D41	.881360E-03	.110445E-02	.798011	[.425]
G4242	-.089493	.438085E-02	-20.4282	[.000]
A42	-.128198	.016874	-7.59756	[.000]
B42	-.723724E-03	.791578E-03	-.914280	[.361]
D42	.237166E-02	.102677E-02	2.30984	[.021]
G4343	-.078143	.361159E-02	-21.6368	[.000]
A43	-.160519	.018500	-8.67674	[.000]
B43	-.130130E-02	.880922E-03	-1.47721	[.140]
D43	.259360E-02	.115327E-02	2.24891	[.025]
G4444	-.107026	.811843E-02	-13.1831	[.000]
A44	-.232617	.037219	-6.24991	[.000]
B44	.593109E-02	.145852E-02	4.06652	[.000]
D44	.146200E-02	.185311E-02	.788943	[.430]

SPECIFICATION #10

```
L0  = coefficient for   WF*NSSJD*lnPj
L1  = coefficient for   WF*NSSJD*SUJD*lnPj
L2  = coefficient for   WF*NSSJD*(SUJD^2)*lnPj
L3  = coefficient for   WF*NSSJD*(SUJD^3)*lnPj
L4  = coefficient for   WF*NSSJD*(SUJD^4)*lnPj
L5  = coefficient for   WF*(1 – NSSJD)*lnPj
L6  = coefficient for   WF*(1 – NSSJD)*SUJD*lnPj
L7  = coefficient for   WF*(1 – NSSJD)*(SUJD^2)*lnPj
```

```
L8  = coefficient for   WF*(1 – NSSJD)*(SUJD^3)*lnPj
L9  = coefficient for   WF*(1 – NSSJD)*(SUJD^4)*lnPj
L10 = coefficient for   (1 – WF)*NSSJD*lnPj
L11 = coefficient for   (1 – WF)*NSSJD*SUJD*lnPj
L12 = coefficient for   (1 – WF)*NSSJD*(SUJD^2)*lnPj
L13 = coefficient for   (1 – WF)*NSSJD*(SUJD^3)*lnPj
L14 = coefficient for   (1 – WF)*NSSJD*(SUJD^4)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.089126	.607192E-02	-14.6784	[.000]
L1	1.20964	.131724	9.18316	[.000]
L2	-5.92277	.868784	-6.81731	[.000]
L3	11.3134	1.87222	6.04278	[.000]
L4	-6.77478	1.16449	-5.81780	[.000]
L5	-.113929E-02	.266931E-03	-4.26809	[.000]
L6	.300197	.024810	12.1000	[.000]
L7	-4.70807	.523827	-8.98783	[.000]
L8	30.5272	3.37637	9.04142	[.000]
L9	-57.6439	6.14821	-9.37572	[.000]
L10	-.019951	.395323E-02	-5.04673	[.000]
L11	.467555	.082059	5.69782	[.000]
L12	-3.49477	.529405	-6.60131	[.000]
L13	9.26388	1.24464	7.44302	[.000]
L14	-7.34114	.923624	-7.94820	[.000]
L15	.787631E-03	.110778E-03	7.11001	[.000]
L16	.013733	.684674E-02	2.00583	[.045]
L17	-.283313	.076519	-3.70253	[.000]
L18	.948687	.241418	3.92965	[.000]
L19	-.882039	.215222	-4.09828	[.000]
G11	-.328033	.010015	-32.7532	[.000]
A1	-.022978	.140161	-.163943	[.870]
B1	-.047638	.921602E-02	-5.16905	[.000]
D1	.013721	.012164	1.12798	[.259]
RHO	.820547	.010954	74.9056	[.000]
G22	-.281643	.756491E-02	-37.2301	[.000]
A2	-.052572	.068080	-.772203	[.440]
B2	-.034408	.422154E-02	-8.15069	[.000]
D2	-.527796E-02	.565713E-02	-.932974	[.351]
G33	-.367238	.846463E-02	-43.3850	[.000]
A3	-.195216	.098551	-1.98086	[.048]
B3	-.051913	.681551E-02	-7.61695	[.000]
D3	.013008	.855320E-02	1.52082	[.128]
G44	-.138935	.778436E-02	-17.8479	[.000]
A4	.148764	.079077	1.88126	[.060]
B4	-.014676	.536906E-02	-2.73340	[.006]
D4	.477011E-02	.677873E-02	.703688	[.482]
G55	-.256460	.027729	-9.24869	[.000]
A5	-.435250	.088700	-4.90700	[.000]
B5	-.014134	.249689E-02	-5.66073	[.000]
D5	-.695781E-02	.333727E-02	-2.08488	[.037]
G66	-.071122	.354652E-02	-20.0541	[.000]
A6	-.045668	.043993	-1.03808	[.299]
B6	-.723290E-02	.262697E-02	-2.75332	[.006]
D6	-.533526E-02	.347893E-02	-1.53359	[.125]
G77	-.142254	.604876E-02	-23.5179	[.000]
A7	-.124967	.045437	-2.75037	[.006]
B7	-.011108	.257232E-02	-4.31827	[.000]
D7	-.153340E-02	.344302E-02	-.445364	[.656]
G88	-.363943	.711990E-02	-51.1163	[.000]

A8	-.769035	.155226	-4.95429	[.000]
B8	-.929864E-02	.010156	-.915578	[.360]
D8	.010569	.013432	.786860	[.431]
G99	-.107600	.298674E-02	-36.0260	[.000]
A9	.018331	.026362	.695342	[.487]
B9	-.856798E-02	.160962E-02	-5.32299	[.000]
D9	-.222903E-02	.214695E-02	-1.03823	[.299]
G1010	-.100715	.385534E-02	-26.1235	[.000]
A10	-.049183	.034307	-1.43359	[.152]
B10	-.733549E-02	.211044E-02	-3.47581	[.001]
D10	-.414829E-02	.282330E-02	-1.46931	[.142]
G1111	-.075116	.328595E-02	-22.8597	[.000]
A11	.028117	.031517	.892120	[.372]
B11	-.835757E-02	.212607E-02	-3.93100	[.000]
D11	-.363460E-03	.268035E-02	-.135602	[.892]
G1212	-.104562	.407562E-02	-25.6556	[.000]
A12	.039331	.049060	.801685	[.423]
B12	-.012111	.292840E-02	-4.13580	[.000]
D12	.178706E-02	.390108E-02	.458094	[.647]
G1313	-.068392	.358219E-02	-19.0923	[.000]
A13	.063205	.040369	1.56567	[.117]
B13	-.310916E-02	.272018E-02	-1.14300	[.253]
D13	.163195E-02	.343156E-02	.475570	[.634]
G1414	-.313943	.779073E-02	-40.2970	[.000]
A14	-1.00251	.104909	-9.55604	[.000]
B14	.012694	.698990E-02	1.81600	[.069]
D14	-.733271E-02	.912211E-02	-.803839	[.421]
G1515	-.078554	.337347E-02	-23.2859	[.000]
A15	-.030834	.039842	-.773897	[.439]
B15	-.463681E-02	.268004E-02	-1.73013	[.084]
D15	-.101541E-02	.340756E-02	-.297987	[.766]
G1616	-.140417	.022866	-6.14078	[.000]
A16	-.169493	.071156	-2.38198	[.017]
B16	-.533725E-02	.161197E-02	-3.31101	[.001]
D16	.128366E-02	.214894E-02	.597344	[.550]
G1717	-.072913	.210259E-02	-34.6779	[.000]
A17	.051118	.026426	1.93438	[.053]
B17	-.704693E-02	.173200E-02	-4.06865	[.000]
D17	.223520E-02	.217065E-02	1.02974	[.303]
G1818	-.026165	.401751E-02	-6.51280	[.000]
A18	-.027589	.033621	-.820572	[.412]
B18	-.182885E-02	.195502E-02	-.935464	[.350]
D18	-.404082E-02	.259012E-02	-1.56009	[.119]
G1919	-.118111	.020998	-5.62481	[.000]
A19	-.078482	.111694	-.702654	[.482]
B19	.107022E-02	.579595E-02	.184649	[.854]
D19	-.021522	.761928E-02	-2.82470	[.005]
G2020	-.094703	.287846E-02	-32.9004	[.000]
A20	-.063748	.024284	-2.62504	[.009]
B20	-.320047E-02	.149580E-02	-2.13963	[.032]
D20	.315026E-04	.187713E-02	.016782	[.987]
G2121	-.046868	.252272E-02	-18.5785	[.000]
A21	.088256	.021911	4.02787	[.000]
B21	-.513900E-02	.133133E-02	-3.86006	[.000]
D21	-.173332E-02	.177295E-02	-.977644	[.328]
G2222	-.015119	.645827E-02	-2.34108	[.019]
A22	.077644	.063487	1.22298	[.221]
B22	-.566796E-03	.250010E-02	-.226709	[.821]
D22	-.376051E-02	.338143E-02	-1.11211	[.266]
G2323	-.040536	.567322E-02	-7.14522	[.000]
A23	.243074	.042734	5.68808	[.000]

B23	-.392310E-02	.274613E-02	-1.42859	[.153]
D23	.308841E-02	.352600E-02	.875898	[.381]
G2424	-.018377	.204248E-02	-8.99720	[.000]
A24	.051197	.030447	1.68149	[.093]
B24	-.126716E-02	.184265E-02	-.687684	[.492]
D24	-.127013E-02	.244670E-02	-.519119	[.604]
G2525	-.073925	.183691E-02	-40.2444	[.000]
A25	.034450	.021077	1.63454	[.102]
B25	-.233988E-02	.126400E-02	-1.85117	[.064]
D25	-.157091E-02	.167809E-02	-.936134	[.349]
G2626	-.118024	.590351E-02	-19.9921	[.000]
A26	-.274176	.026144	-10.4872	[.000]
B26	-.171212E-02	.931969E-03	-1.83710	[.066]
D26	.144903E-02	.122708E-02	1.18087	[.238]
G2727	-.043733	.256800E-02	-17.0299	[.000]
A27	-.058971	.024626	-2.39469	[.017]
B27	-.350886E-02	.149538E-02	-2.34646	[.019]
D27	-.256501E-02	.182643E-02	-1.40438	[.160]
G2828	-.031697	.309662E-02	-10.2359	[.000]
A28	.080525	.033451	2.40721	[.016]
B28	-.184646E-02	.204145E-02	-.904486	[.366]
D28	-.566267E-03	.271898E-02	-.208264	[.835]
G2929	-.038700	.250715E-02	-15.4358	[.000]
A29	.047042	.025724	1.82876	[.067]
B29	-.167600E-02	.173998E-02	-.963229	[.335]
D29	.207890E-02	.217215E-02	.957068	[.339]
G3030	-.044136	.193595E-02	-22.7981	[.000]
A30	.065755	.015947	4.12335	[.000]
B30	-.271890E-02	.899182E-03	-3.02374	[.002]
D30	.331323E-03	.118018E-02	.280739	[.779]
G3131	-.046598	.397591E-02	-11.7201	[.000]
A31	.063770	.016766	3.80350	[.000]
B31	-.202511E-02	.934389E-03	-2.16731	[.030]
D31	-.720665E-03	.116349E-02	-.619402	[.536]
G3232	-.039914	.205106E-02	-19.4600	[.000]
A32	.074717	.018399	4.06085	[.000]
B32	-.130046E-02	.109721E-02	-1.18524	[.236]
D32	-.127947E-02	.145527E-02	-.879193	[.379]
G3333	-.070739	.326289E-02	-21.6797	[.000]
A33	-.072666	.022250	-3.26592	[.001]
B33	-.179864E-02	.114983E-02	-1.56427	[.118]
D33	-.161947E-02	.152768E-02	-1.06008	[.289]
G3434	-.117172	.638628E-02	-18.3474	[.000]
A34	-.127989	.022668	-5.64619	[.000]
B34	-.350969E-02	.109392E-02	-3.20836	[.001]
D34	.237602E-02	.144986E-02	1.63880	[.101]
G3535	-.064449	.394503E-02	-16.3367	[.000]
A35	.017060	.023878	.714441	[.475]
B35	-.253461E-02	.120621E-02	-2.10130	[.036]
D35	.388011E-03	.160085E-02	.242379	[.808]
G3636	-.027560	.249691E-02	-11.0377	[.000]
A36	.558015E-02	.028229	.197676	[.843]
B36	-.132424E-02	.166367E-02	-.795975	[.426]
D36	-.142088E-02	.217999E-02	-.651786	[.515]
G3737	-.019263	.154358E-02	-12.4797	[.000]
A37	.111255	.022049	5.04576	[.000]
B37	-.236765E-02	.131874E-02	-1.79539	[.073]
D37	-.541008E-03	.173802E-02	-.311279	[.756]
G3838	-.024393	.018309	-1.33226	[.183]
A38	-.028006	.022017	-1.27199	[.203]
B38	.526250E-03	.126455E-02	.416155	[.677]

D38	.234660E-02	.156388E-02	1.50049	[.133]
G3939	-.107030	.501262E-02	-21.3521	[.000]
A39	-.111626	.018114	-6.16248	[.000]
B39	-.250124E-02	.864282E-03	-2.89401	[.004]
D39	.201521E-02	.113506E-02	1.77541	[.076]
G4040	-.117532	.531401E-02	-22.1173	[.000]
A40	-.331785	.025711	-12.9042	[.000]
B40	.244439E-03	.921021E-03	.265400	[.791]
D40	.258820E-03	.121002E-02	.213898	[.831]
G4141	.021515	.018604	1.15647	[.247]
A41	.036151	.020189	1.79065	[.073]
B41	.266073E-03	.112630E-02	.236236	[.813]
D41	.108626E-02	.137552E-02	.789707	[.430]
G4242	-.077131	.454147E-02	-16.9837	[.000]
A42	-.115537	.016612	-6.95496	[.000]
B42	-.163303E-02	.768823E-03	-2.12406	[.034]
D42	.206100E-02	.100533E-02	2.05008	[.040]
G4343	-.076353	.371154E-02	-20.5717	[.000]
A43	-.164049	.018704	-8.77082	[.000]
B43	-.108986E-02	.888235E-03	-1.22699	[.220]
D43	.254741E-02	.116933E-02	2.17851	[.029]
G4444	-.102216	.716552E-02	-14.2650	[.000]
A44	-.207730	.034187	-6.07627	[.000]
B44	.674927E-02	.142614E-02	4.73256	[.000]
D44	.154505E-02	.178940E-02	.863446	[.388]

SPECIFICATION #11

L0 = coefficient for WF*WB*lnPj
L1 = coefficient for WF*WB*SUJD*lnPj
L2 = coefficient for WF*(1 – WB)*lnPj
L3 = coefficient for WF*(1 – WB)*SUJD*lnPj
L4 = coefficient for (1 – WF)*WB*lnPj
L5 = coefficient for (1 – WF)*WB*SUJD*lnPj
L6 = coefficient for (1 – WF)*(1 – WB)*lnPj
L7 = coefficient for (1 – WF)*(1 – WB)*SUJD*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.181307E-02	.276612E-03	-6.55455	[.000]
L1	.011526	.411098E-02	2.80379	[.005]
L2	.325422E-02	.209102E-03	15.5629	[.000]
L3	.025745	.434508E-02	5.92503	[.000]
L4	.287504E-03	.160914E-03	1.78669	[.074]
L5	.295864E-02	.100606E-02	2.94083	[.003]
L6	.746841E-03	.820114E-04	9.10656	[.000]
L7	.013078	.219125E-02	5.96844	[.000]
G11	-.335342	.962894E-02	-34.8265	[.000]
A1	-.067220	.136526	-.492361	[.622]
B1	-.052151	.897450E-02	-5.81106	[.000]
D1	.013492	.011823	1.14114	[.254]
RHO	.818021	.010507	77.8570	[.000]
G22	-.275010	.804022E-02	-34.2043	[.000]

A2	-.045649	.068810	-.663402	[.507]
B2	-.034379	.422601E-02	-8.13501	[.000]
D2	-.553775E-02	.565183E-02	-.979814	[.327]
G33	-.378294	.867240E-02	-43.6205	[.000]
A3	-.197020	.100466	-1.96106	[.050]
B3	-.052013	.695235E-02	-7.48142	[.000]
D3	.013105	.869437E-02	1.50729	[.132]
G44	-.124771	.715317E-02	-17.4428	[.000]
A4	.975260E-02	.070438	.138456	[.890]
B4	-.015467	.483739E-02	-3.19735	[.001]
D4	.108204E-02	.610297E-02	.177298	[.859]
G55	-.246624	.027760	-8.88408	[.000]
A5	-.327858	.088207	-3.71691	[.000]
B5	-.013731	.237266E-02	-5.78738	[.000]
D5	-.748979E-02	.316293E-02	-2.36799	[.018]
G66	-.098698	.401073E-02	-24.6084	[.000]
A6	.266259E-02	.046488	.057275	[.954]
B6	-.732822E-02	.282591E-02	-2.59322	[.010]
D6	-.538277E-02	.373896E-02	-1.43964	[.150]
G77	-.141670	.656822E-02	-21.5690	[.000]
A7	-.097592	.044139	-2.21100	[.027]
B7	-.010872	.241449E-02	-4.50294	[.000]
D7	-.112002E-02	.322407E-02	-.347395	[.728]
G88	-.372381	.888207E-02	-41.9251	[.000]
A8	-.762406	.165057	-4.61906	[.000]
B8	-.013726	.010879	-1.26174	[.207]
D8	.011157	.014306	.779928	[.435]
G99	-.088749	.254488E-02	-34.8736	[.000]
A9	.027202	.024460	1.11209	[.266]
B9	-.893806E-02	.145876E-02	-6.12715	[.000]
D9	-.263444E-02	.193455E-02	-1.36178	[.173]
G1010	-.096988	.301326E-02	-32.1871	[.000]
A10	-.017290	.028236	-.612343	[.540]
B10	-.747585E-02	.169449E-02	-4.41186	[.000]
D10	-.499111E-02	.225439E-02	-2.21395	[.027]
G1111	-.081770	.271882E-02	-30.0756	[.000]
A11	.020292	.031100	.652458	[.514]
B11	-.906443E-02	.207007E-02	-4.37881	[.000]
D11	-.717584E-03	.263014E-02	-.272831	[.785]
G1212	-.103757	.412053E-02	-25.1804	[.000]
A12	.020326	.049156	.413500	[.679]
B12	-.011065	.295392E-02	-3.74602	[.000]
D12	.152744E-02	.393321E-02	.388345	[.698]
G1313	-.063564	.356400E-02	-17.8351	[.000]
A13	.046201	.039493	1.16984	[.242]
B13	-.394967E-02	.271121E-02	-1.45679	[.145]
D13	.174230E-02	.337729E-02	.515887	[.606]
G1414	-.313235	.894814E-02	-35.0056	[.000]
A14	-.986203	.104137	-9.47022	[.000]
B14	.010416	.699441E-02	1.48922	[.136]
D14	-.791990E-02	.903305E-02	-.876769	[.381]
G1515	-.079064	.311899E-02	-25.3494	[.000]
A15	-.053279	.040770	-1.30683	[.191]
B15	-.526162E-02	.271665E-02	-1.93680	[.053]
D15	-.171171E-02	.348349E-02	-.491378	[.623]
G1616	-.113672	.020209	-5.62475	[.000]
A16	-.087845	.063877	-1.37521	[.169]
B16	-.518132E-02	.159034E-02	-3.25799	[.001]
D16	.139498E-02	.211139E-02	.660693	[.509]
G1717	-.086133	.181591E-02	-47.4323	[.000]
A17	.068549	.025059	2.73552	[.006]

B17	-.903037E-02	.162851E-02	-5.54518	[.000]
D17	.220814E-02	.202337E-02	1.09132	[.275]
G1818	-.076758	.562636E-02	-13.6425	[.000]
A18	-.051086	.043769	-1.16717	[.243]
B18	-.255885E-02	.245482E-02	-1.04238	[.297]
D18	-.444823E-02	.324099E-02	-1.37249	[.170]
G1919	-.146875	.021926	-6.69862	[.000]
A19	-.162646	.114613	-1.41908	[.156]
B19	-.142868E-02	.584448E-02	-.244450	[.807]
D19	-.021098	.775021E-02	-2.72228	[.006]
G2020	-.097177	.243928E-02	-39.8382	[.000]
A20	-.051332	.024829	-2.06740	[.039]
B20	-.588946E-02	.148429E-02	-3.96786	[.000]
D20	-.843710E-03	.194452E-02	-.433890	[.664]
G2121	-.047564	.229832E-02	-20.6953	[.000]
A21	.074716	.022694	3.29240	[.001]
B21	-.512263E-02	.136628E-02	-3.74932	[.000]
D21	-.206486E-02	.181077E-02	-1.14032	[.254]
G2222	-.625906E-02	.594333E-02	-1.05312	[.292]
A22	.151411	.059059	2.56372	[.010]
B22	-.311503E-03	.248662E-02	-.125271	[.900]
D22	-.286259E-02	.334671E-02	-.855343	[.392]
G2323	-.038748	.651008E-02	-5.95204	[.000]
A23	.264383	.045597	5.79820	[.000]
B23	.223624E-02	.294357E-02	.759703	[.447]
D23	.327733E-02	.379752E-02	.863020	[.388]
G2424	-.018849	.284490E-02	-6.62565	[.000]
A24	.103465	.034629	2.98782	[.003]
B24	-.146764E-02	.208696E-02	-.703244	[.482]
D24	-.166462E-02	.276344E-02	-.602371	[.547]
G2525	-.047747	.152600E-02	-31.2890	[.000]
A25	.014378	.022676	.634095	[.526]
B25	-.143757E-02	.138488E-02	-1.03804	[.299]
D25	-.103689E-02	.183106E-02	-.566279	[.571]
G2626	-.115095	.579276E-02	-19.8688	[.000]
A26	-.252417	.026111	-9.66701	[.000]
B26	-.163790E-02	.943345E-03	-1.73627	[.083]
D26	.139887E-02	.123514E-02	1.13256	[.257]
G2727	-.046550	.209624E-02	-22.2067	[.000]
A27	.073323	.023842	3.07538	[.002]
B27	-.444715E-02	.155934E-02	-2.85195	[.004]
D27	-.943823E-03	.193264E-02	-.488360	[.625]
G2828	-.030184	.319726E-02	-9.44071	[.000]
A28	.103014	.033866	3.04180	[.002]
B28	-.219406E-02	.205901E-02	-1.06559	[.287]
D28	-.430887E-03	.273589E-02	-.157494	[.875]
G2929	-.032702	.230699E-02	-14.1750	[.000]
A29	.063674	.025085	2.53832	[.011]
B29	-.205410E-02	.166281E-02	-1.23532	[.217]
D29	.181700E-02	.208640E-02	.870879	[.384]
G3030	-.034011	.144650E-02	-23.5128	[.000]
A30	.057058	.015118	3.77413	[.000]
B30	-.236455E-02	.853504E-03	-2.77041	[.006]
D30	-.635776E-04	.110798E-02	-.057382	[.954]
G3131	-.030845	.206610E-02	-14.9291	[.000]
A31	.078779	.014722	5.35104	[.000]
B31	-.116786E-02	.770593E-03	-1.51554	[.130]
D31	-.466811E-03	.980002E-03	-.476337	[.634]
G3232	-.030898	.173758E-02	-17.7824	[.000]
A32	.046497	.019603	2.37189	[.018]
B32	-.140773E-02	.115604E-02	-1.21772	[.223]

D32	-.168206E-02	.152450E-02	-1.10335	[.270]
G3333	-.062771	.352638E-02	-17.8004	[.000]
A33	.308439E-02	.022168	.139139	[.889]
B33	-.156111E-02	.107813E-02	-1.44797	[.148]
D33	-.952008E-03	.142348E-02	-.668789	[.504]
G3434	-.091841	.532509E-02	-17.2469	[.000]
A34	-.059162	.024281	-2.43653	[.015]
B34	-.202891E-02	.116052E-02	-1.74827	[.080]
D34	.280096E-02	.152997E-02	1.83073	[.067]
G3535	-.064323	.362629E-02	-17.7379	[.000]
A35	.010751	.023360	.460231	[.645]
B35	-.263602E-02	.118339E-02	-2.22750	[.026]
D35	.580553E-03	.156599E-02	.370725	[.711]
G3636	-.035027	.267897E-02	-13.0746	[.000]
A36	.021404	.026714	.801224	[.423]
B36	.124069E-02	.153642E-02	.807517	[.419]
D36	-.136864E-02	.199708E-02	-.685323	[.493]
G3737	-.016325	.147134E-02	-11.0952	[.000]
A37	.149414	.022917	6.51972	[.000]
B37	-.154374E-02	.137152E-02	-1.12556	[.260]
D37	-.564890E-03	.180944E-02	-.312191	[.755]
G3838	-.084743	.429317E-02	-19.7391	[.000]
A38	-.061936	.020390	-3.03765	[.002]
B38	-.288808E-02	.115112E-02	-2.50892	[.012]
D38	.964531E-03	.149732E-02	.644173	[.519]
G3939	-.082213	.405339E-02	-20.2826	[.000]
A39	-.086255	.019504	-4.42256	[.000]
B39	-.202740E-03	.940497E-03	-.215566	[.829]
D39	.239750E-02	.122560E-02	1.95619	[.050]
G4040	-.120701	.552759E-02	-21.8360	[.000]
A40	-.275854	.025358	-10.8782	[.000]
B40	.726182E-03	.936031E-03	.775810	[.438]
D40	.979292E-03	.121790E-02	.804083	[.421]
G4141	-.059894	.413785E-02	-14.4746	[.000]
A41	.012519	.014893	.840616	[.401]
B41	-.251952E-02	.808226E-03	-3.11735	[.002]
D41	.868538E-03	.100862E-02	.861119	[.389]
G4242	-.079776	.352819E-02	-22.6110	[.000]
A42	-.095295	.017602	-5.41395	[.000]
B42	.660136E-03	.844369E-03	.781810	[.434]
D42	.250574E-02	.109396E-02	2.29052	[.022]
G4343	-.073651	.391620E-02	-18.8067	[.000]
A43	-.059921	.018539	-3.23227	[.001]
B43	-.884996E-03	.843380E-03	-1.04934	[.294]
D43	.251223E-02	.110063E-02	2.28253	[.022]
G4444	-.098013	.686622E-02	-14.2746	[.000]
A44	-.170553	.033166	-5.14241	[.000]
B44	.533099E-02	.136757E-02	3.89813	[.000]
D44	.124315E-02	.173887E-02	.714920	[.475]

SPECIFICATION #12

L0 = coefficient for WF*WB*lnPj
L1 = coefficient for WF*WB*SUJD*lnPj
L2 = coefficient for WF*WB*(SUJD^2)*lnPj
L3 = coefficient for WF*(1 – WB)*lnPj

```
L4  = coefficient for   WF*(1 – WB)*SUJD*lnPj
L5  = coefficient for   WF*(1 – WB)*(SUJD^2)*lnPj
L6  = coefficient for   (1 – WF)*WB*lnPj
L7  = coefficient for   (1 – WF)*WB*SUJD*lnPj
L8  = coefficient for   (1 – WF)*WB*(SUJD^2)*lnPj
L9  = coefficient for   (1 – WF)*(1 – WB)*lnPj
L10 = coefficient for   (1 – WF)*(1 – WB)*SUJD*lnPj
L11 = coefficient for   (1 – WF)*(1 – WB)*(SUJD^2)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.192434E-02	.310094E-03	-6.20568	[.000]
L1	.010313	.681368E-02	1.51356	[.130]
L2	.012958	.024371	.531701	[.595]
L3	.125645E-02	.191567E-03	6.55883	[.000]
L4	.103200	.864609E-02	11.9360	[.000]
L5	-.201847	.027803	-7.25984	[.000]
L6	.565879E-03	.183025E-03	3.09181	[.002]
L7	-.532610E-02	.331531E-02	-1.60652	[.108]
L8	.013540	.532184E-02	2.54429	[.011]
L9	.624428E-03	.971595E-04	6.42683	[.000]
L10	.028451	.434784E-02	6.54362	[.000]
L11	-.122612	.022281	-5.50288	[.000]
G11	-.335496	.954110E-02	-35.1632	[.000]
A1	-.040370	.137284	-.294062	[.769]
B1	-.050753	.902281E-02	-5.62496	[.000]
D1	.013716	.011896	1.15298	[.249]
RHO	.818931	.010400	78.7414	[.000]
G22	-.274517	.822399E-02	-33.3800	[.000]
A2	-.045836	.069127	-.663072	[.507]
B2	-.034267	.423054E-02	-8.09998	[.000]
D2	-.538144E-02	.566305E-02	-.950273	[.342]
G33	-.375538	.948293E-02	-39.6015	[.000]
A3	-.185714	.102059	-1.81968	[.069]
B3	-.050397	.714139E-02	-7.05704	[.000]
D3	.012949	.883491E-02	1.46563	[.143]
G44	-.125084	.746203E-02	-16.7627	[.000]
A4	.013588	.070471	.192816	[.847]
B4	-.016123	.486353E-02	-3.31507	[.001]
D4	.866298E-03	.610465E-02	.141908	[.887]
G55	-.241218	.027069	-8.91129	[.000]
A5	-.314004	.086373	-3.63545	[.000]
B5	-.013691	.236569E-02	-5.78731	[.000]
D5	-.775088E-02	.315520E-02	-2.45654	[.014]
G66	-.098345	.405766E-02	-24.2368	[.000]
A6	.917255E-02	.046621	.196746	[.844]
B6	-.723709E-02	.283020E-02	-2.55710	[.011]
D6	-.529439E-02	.374670E-02	-1.41308	[.158]
G77	-.143420	.608297E-02	-23.5773	[.000]
A7	-.109086	.044542	-2.44907	[.014]
B7	-.010613	.250850E-02	-4.23101	[.000]
D7	-.125319E-02	.335013E-02	-.374073	[.708]
G88	-.368716	.819602E-02	-44.9872	[.000]
A8	-.783526	.160828	-4.87184	[.000]
B8	-.011726	.010568	-1.10955	[.267]
D8	.010675	.013923	.766753	[.443]
G99	-.088920	.259109E-02	-34.3175	[.000]
A9	.029241	.024468	1.19507	[.232]
B9	-.881738E-02	.145917E-02	-6.04275	[.000]
D9	-.251436E-02	.193551E-02	-1.29907	[.194]
G1010	-.097087	.301825E-02	-32.1667	[.000]

A10	-.015466	.028306	-.546386	[.585]
B10	-.731223E-02	.169853E-02	-4.30503	[.000]
D10	-.484270E-02	.226075E-02	-2.14208	[.032]
G1111	-.082278	.291661E-02	-28.2103	[.000]
A11	.024979	.031178	.801175	[.423]
B11	-.926544E-02	.208662E-02	-4.44041	[.000]
D11	-.707145E-03	.263277E-02	-.268593	[.788]
G1212	-.104163	.405660E-02	-25.6775	[.000]
A12	.061866	.048941	1.26409	[.206]
B12	-.010783	.294319E-02	-3.66359	[.000]
D12	.228114E-02	.392180E-02	.581658	[.561]
G1313	-.063674	.380631E-02	-16.7285	[.000]
A13	.042679	.039547	1.07920	[.280]
B13	-.446830E-02	.272404E-02	-1.64032	[.101]
D13	.153492E-02	.336639E-02	.455953	[.648]
G1414	-.312157	.869707E-02	-35.8922	[.000]
A14	-.990983	.104747	-9.46071	[.000]
B14	.013632	.702745E-02	1.93987	[.052]
D14	-.732138E-02	.909029E-02	-.805407	[.421]
G1515	-.078507	.316266E-02	-24.8231	[.000]
A15	-.056101	.040815	-1.37453	[.169]
B15	-.508938E-02	.271676E-02	-1.87333	[.061]
D15	-.165059E-02	.348215E-02	-.474014	[.635]
G1616	-.108586	.019209	-5.65280	[.000]
A16	-.075896	.061321	-1.23769	[.216]
B16	-.502654E-02	.159774E-02	-3.14603	[.002]
D16	.119742E-02	.212225E-02	.564220	[.573]
G1717	-.082554	.198937E-02	-41.4978	[.000]
A17	.078069	.028210	2.76745	[.006]
B17	-.667195E-02	.184237E-02	-3.62139	[.000]
D17	.205966E-02	.229069E-02	.899145	[.369]
G1818	-.079149	.543563E-02	-14.5612	[.000]
A18	-.059786	.043231	-1.38296	[.167]
B18	-.232145E-02	.243253E-02	-.954338	[.340]
D18	-.439168E-02	.321548E-02	-1.36579	[.172]
G1919	-.137009	.022437	-6.10629	[.000]
A19	-.117646	.114367	-1.02867	[.304]
B19	-.238742E-02	.573172E-02	-.416528	[.677]
D19	-.021709	.757108E-02	-2.86740	[.004]
G2020	-.096345	.270135E-02	-35.6656	[.000]
A20	-.051309	.025443	-2.01664	[.044]
B20	-.619866E-02	.152147E-02	-4.07413	[.000]
D20	-.901668E-03	.197641E-02	-.456216	[.648]
G2121	-.046384	.232518E-02	-19.9487	[.000]
A21	.078809	.022791	3.45782	[.001]
B21	-.499531E-02	.137226E-02	-3.64021	[.000]
D21	-.181957E-02	.181927E-02	-1.00016	[.317]
G2222	-.010197	.622731E-02	-1.63753	[.102]
A22	.142467	.061465	2.31784	[.020]
B22	-.239257E-03	.253009E-02	-.094565	[.925]
D22	-.300899E-02	.341078E-02	-.882199	[.378]
G2323	-.035464	.700318E-02	-5.06396	[.000]
A23	.247034	.048970	5.04463	[.000]
B23	.556900E-02	.317992E-02	1.75130	[.080]
D23	.328231E-02	.409469E-02	.801602	[.423]
G2424	-.019944	.288350E-02	-6.91659	[.000]
A24	.107907	.034808	3.10007	[.002]
B24	-.104601E-02	.209013E-02	-.500452	[.617]
D24	-.163023E-02	.276904E-02	-.588735	[.556]
G2525	-.048749	.172098E-02	-28.3265	[.000]
A25	.013236	.022776	.581119	[.561]

B25	-.131713E-02	.139297E-02	-.945554	[.344]
D25	-.960251E-03	.184235E-02	-.521211	[.602]
G2626	-.115434	.624378E-02	-18.4878	[.000]
A26	-.247433	.027696	-8.93378	[.000]
B26	-.149981E-02	.960197E-03	-1.56198	[.118]
D26	.157618E-02	.125718E-02	1.25374	[.210]
G2727	-.046069	.215574E-02	-21.3705	[.000]
A27	.073460	.024414	3.00887	[.003]
B27	-.481957E-02	.159586E-02	-3.02006	[.003]
D27	-.803487E-03	.196590E-02	-.408712	[.683]
G2828	-.029494	.315897E-02	-9.33645	[.000]
A28	.113851	.034169	3.33204	[.001]
B28	-.214590E-02	.207836E-02	-1.03250	[.302]
D28	-.345495E-03	.276290E-02	-.125048	[.900]
G2929	-.032501	.244519E-02	-13.2918	[.000]
A29	.059496	.025092	2.37116	[.018]
B29	-.223118E-02	.167036E-02	-1.33575	[.182]
D29	.193722E-02	.208594E-02	.928705	[.353]
G3030	-.033893	.155402E-02	-21.8100	[.000]
A30	.059281	.015320	3.86946	[.000]
B30	-.225054E-02	.859962E-03	-2.61702	[.009]
D30	.444668E-04	.111486E-02	.039886	[.968]
G3131	-.028802	.222778E-02	-12.9286	[.000]
A31	.075731	.015103	5.01414	[.000]
B31	-.177402E-02	.806232E-03	-2.20038	[.028]
D31	-.376123E-03	.995445E-03	-.377844	[.706]
G3232	-.030076	.172014E-02	-17.4849	[.000]
A32	.044562	.019802	2.25035	[.024]
B32	-.122244E-02	.116874E-02	-1.04595	[.296]
D32	-.145157E-02	.154151E-02	-.941651	[.346]
G3333	-.066492	.336025E-02	-19.7879	[.000]
A33	-.030176	.021287	-1.41755	[.156]
B33	-.140316E-02	.102984E-02	-1.36250	[.173]
D33	-.126508E-02	.135772E-02	-.931766	[.351]
G3434	-.086515	.548983E-02	-15.7592	[.000]
A34	-.064777	.024091	-2.68888	[.007]
B34	-.222722E-02	.111421E-02	-1.99892	[.046]
D34	.234808E-02	.146831E-02	1.59917	[.110]
G3535	-.062571	.372457E-02	-16.7994	[.000]
A35	.024487	.023839	1.02716	[.304]
B35	-.257205E-02	.119869E-02	-2.14572	[.032]
D35	.567143E-03	.158590E-02	.357615	[.721]
G3636	-.035046	.267352E-02	-13.1085	[.000]
A36	.035848	.026218	1.36728	[.172]
B36	.681222E-03	.148771E-02	.457900	[.647]
D36	-.148738E-02	.193529E-02	-.768559	[.442]
G3737	-.015937	.144443E-02	-11.0335	[.000]
A37	.147167	.022295	6.60091	[.000]
B37	-.159401E-02	.132242E-02	-1.20537	[.228]
D37	-.602781E-03	.174459E-02	-.345515	[.730]
G3838	-.093610	.016991	-5.50934	[.000]
A38	-.055889	.020722	-2.69702	[.007]
B38	-.283084E-02	.116580E-02	-2.42824	[.015]
D38	.111597E-02	.151134E-02	.738398	[.460]
G3939	-.082856	.434233E-02	-19.0810	[.000]
A39	-.079288	.019182	-4.13350	[.000]
B39	-.874254E-03	.886454E-03	-.986238	[.324]
D39	.201722E-02	.115472E-02	1.74694	[.081]
G4040	-.120033	.553414E-02	-21.6896	[.000]
A40	-.273234	.025651	-10.6522	[.000]
B40	.628116E-03	.947432E-03	.662966	[.507]

D40	.105730E-02	.123463E-02	.856369	[.392]
G4141	-.070503	.016995	-4.14849	[.000]
A41	.012330	.015175	.812484	[.417]
B41	-.236650E-02	.823138E-03	-2.87497	[.004]
D41	.947993E-03	.101610E-02	.932976	[.351]
G4242	-.079567	.390324E-02	-20.3849	[.000]
A42	-.088247	.017356	-5.08457	[.000]
B42	-.142386E-04	.793859E-03	-.017936	[.986]
D42	.213106E-02	.102764E-02	2.07374	[.038]
G4343	-.071837	.401458E-02	-17.8939	[.000]
A43	-.059732	.018692	-3.19561	[.001]
B43	-.747050E-03	.835655E-03	-.893970	[.371]
D43	.229174E-02	.108951E-02	2.10347	[.035]
G4444	-.099559	.732330E-02	-13.5948	[.000]
A44	-.172034	.036168	-4.75658	[.000]
B44	.753387E-02	.155536E-02	4.84380	[.000]
D44	.137296E-02	.195695E-02	.701582	[.483]

SPECIFICATION #13

```
L0  = coefficient for   WF*WB*lnPj
L1  = coefficient for   WF*WB*SUJD*lnPj
L2  = coefficient for   WF*WB*(SUJD^2)*lnPj
L3  = coefficient for   WF*WB*(SUJD^3)*lnPj
L4  = coefficient for   WF*(1 – WB)*lnPj
L5  = coefficient for   WF*(1 – WB)*SUJD*lnPj
L6  = coefficient for   WF*(1 – WB)*(SUJD^2)*lnPj
L7  = coefficient for   WF*(1 – WB)*(SUJD^3)*lnPj
L8  = coefficient for   (1 – WF)*WB*lnPj
L9  = coefficient for   (1 – WF)*WB*SUJD*lnPj
L10 = coefficient for   (1 – WF)*WB*(SUJD^2)*lnPj
L11 = coefficient for   (1 – WF)*WB*(SUJD^3)*lnPj
L12 = coefficient for   (1 – WF)*(1 – WB)*lnPj
L13 = coefficient for   (1 – WF)*(1 – WB)*SUJD*lnPj
L14 = coefficient for   (1 – WF)*(1 – WB)*(SUJD^2)*lnPj
L15 = coefficient for   (1 – WF)*(1 – WB)*(SUJD^3)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.162079E-02	.435033E-03	-3.72567	[.000]
L1	.250022E-02	.016283	.153552	[.878]
L2	.079728	.097301	.819394	[.413]
L3	-.106736	.090660	-1.17732	[.239]
L4	.213635E-02	.211270E-03	10.1119	[.000]
L5	.057230	.011693	4.89447	[.000]
L6	.094637	.108705	.870581	[.384]
L7	-.424228	.213387	-1.98807	[.047]
L8	.908277E-03	.210010E-03	4.32492	[.000]
L9	-.025094	.606017E-02	-4.14089	[.000]
L10	.132228	.028082	4.70863	[.000]
L11	-.133266	.030247	-4.40591	[.000]
L12	.684084E-03	.111607E-03	6.12941	[.000]
L13	.020635	.720262E-02	2.86492	[.004]
L14	.065756	.080115	.820764	[.412]
L15	-.617028	.218635	-2.82218	[.005]
G11	-.337492	.965424E-02	-34.9579	[.000]
A1	-.042641	.137952	-.309098	[.757]

B1	-.051312	.906598E-02	-5.65982	[.000]
D1	.013870	.011959	1.15973	[.246]
RHO	.819780	.011181	73.3210	[.000]
G22	-.274860	.859591E-02	-31.9757	[.000]
A2	-.047298	.069306	-.682459	[.495]
B2	-.034242	.422048E-02	-8.11318	[.000]
D2	-.544734E-02	.565601E-02	-.963106	[.335]
G33	-.375842	.951174E-02	-39.5135	[.000]
A3	-.187285	.101737	-1.84087	[.066]
B3	-.050735	.712675E-02	-7.11901	[.000]
D3	.013097	.881814E-02	1.48522	[.137]
G44	-.127869	.758067E-02	-16.8678	[.000]
A4	.014615	.070562	.207124	[.836]
B4	-.015733	.487211E-02	-3.22919	[.001]
D4	.107676E-02	.610424E-02	.176395	[.860]
G55	-.241261	.028225	-8.54789	[.000]
A5	-.312100	.089351	-3.49296	[.000]
B5	-.013678	.236851E-02	-5.77504	[.000]
D5	-.764318E-02	.316247E-02	-2.41684	[.016]
G66	-.098051	.427825E-02	-22.9184	[.000]
A6	.734551E-02	.046960	.156422	[.876]
B6	-.732493E-02	.283069E-02	-2.58768	[.010]
D6	-.540822E-02	.374786E-02	-1.44302	[.149]
G77	-.141524	.629820E-02	-22.4705	[.000]
A7	-.096376	.044438	-2.16879	[.030]
B7	-.010613	.247189E-02	-4.29346	[.000]
D7	-.119441E-02	.330431E-02	-.361471	[.718]
G88	-.369501	.831742E-02	-44.4250	[.000]
A8	-.774934	.160208	-4.83704	[.000]
B8	-.012124	.010518	-1.15261	[.249]
D8	.010652	.013862	.768482	[.442]
G99	-.089907	.295122E-02	-30.4643	[.000]
A9	.028176	.024712	1.14017	[.254]
B9	-.884510E-02	.146398E-02	-6.04183	[.000]
D9	-.258379E-02	.194439E-02	-1.32884	[.184]
G1010	-.097532	.328346E-02	-29.7041	[.000]
A10	-.014354	.028421	-.505039	[.614]
B10	-.734091E-02	.169545E-02	-4.32978	[.000]
D10	-.489295E-02	.225910E-02	-2.16589	[.030]
G1111	-.080215	.303603E-02	-26.4211	[.000]
A11	.022827	.031322	.728783	[.466]
B11	-.905811E-02	.210433E-02	-4.30450	[.000]
D11	-.759291E-03	.264987E-02	-.286538	[.774]
G1212	-.104548	.398497E-02	-26.2357	[.000]
A12	.059283	.048973	1.21053	[.226]
B12	-.010852	.293572E-02	-3.69647	[.000]
D12	.216686E-02	.391519E-02	.553450	[.580]
G1313	-.064659	.374467E-02	-17.2671	[.000]
A13	.042115	.039632	1.06263	[.288]
B13	-.416840E-02	.272416E-02	-1.53016	[.126]
D13	.144565E-02	.336904E-02	.429098	[.668]
G1414	-.310627	.896684E-02	-34.6418	[.000]
A14	-.986764	.104404	-9.45144	[.000]
B14	.013193	.701693E-02	1.88018	[.060]
D14	-.755870E-02	.906397E-02	-.833928	[.404]
G1515	-.078581	.325319E-02	-24.1551	[.000]
A15	-.053077	.040767	-1.30196	[.193]
B15	-.502449E-02	.271797E-02	-1.84862	[.065]
D15	-.164174E-02	.347964E-02	-.471812	[.637]
G1616	-.108665	.019598	-5.54456	[.000]
A16	-.071582	.062245	-1.15001	[.250]

B16	-.500198E-02	.159562E-02	-3.13482	[.002]
D16	.128331E-02	.212174E-02	.604838	[.545]
G1717	-.084300	.205299E-02	-41.0622	[.000]
A17	.078387	.028377	2.76236	[.006]
B17	-.758787E-02	.185221E-02	-4.09667	[.000]
D17	.203046E-02	.229758E-02	.883741	[.377]
G1818	-.081482	.542617E-02	-15.0164	[.000]
A18	-.072932	.043369	-1.68168	[.093]
B18	-.227224E-02	.243492E-02	-.933188	[.351]
D18	-.453711E-02	.322148E-02	-1.40839	[.159]
G1919	-.136064	.022300	-6.10159	[.000]
A19	-.108438	.114201	-.949533	[.342]
B19	-.259063E-02	.575808E-02	-.449912	[.653]
D19	-.021727	.757825E-02	-2.86701	[.004]
G2020	-.095525	.298224E-02	-32.0313	[.000]
A20	-.055059	.025557	-2.15436	[.031]
B20	-.629605E-02	.154418E-02	-4.07727	[.000]
D20	-.111976E-02	.198011E-02	-.565506	[.572]
G2121	-.045573	.240946E-02	-18.9144	[.000]
A21	.083539	.022831	3.65896	[.000]
B21	-.503205E-02	.136721E-02	-3.68054	[.000]
D21	-.182589E-02	.181435E-02	-1.00636	[.314]
G2222	-.755418E-02	.615099E-02	-1.22812	[.219]
A22	.160577	.061153	2.62585	[.009]
B22	-.270790E-03	.252218E-02	-.107364	[.915]
D22	-.283082E-02	.340243E-02	-.832001	[.405]
G2323	-.036616	.713133E-02	-5.13450	[.000]
A23	.227188	.051119	4.44428	[.000]
B23	.605974E-02	.332026E-02	1.82508	[.068]
D23	.354125E-02	.425097E-02	.833047	[.405]
G2424	-.021009	.295451E-02	-7.11091	[.000]
A24	.110717	.035303	3.13623	[.002]
B24	-.833692E-03	.211243E-02	-.394660	[.693]
D24	-.150246E-02	.280056E-02	-.536485	[.592]
G2525	-.049454	.208611E-02	-23.7063	[.000]
A25	.013767	.023018	.598108	[.550]
B25	-.135374E-02	.139821E-02	-.968197	[.333]
D25	-.103742E-02	.185200E-02	-.560161	[.575]
G2626	-.115804	.589908E-02	-19.6309	[.000]
A26	-.251247	.026708	-9.40731	[.000]
B26	-.155153E-02	.952088E-03	-1.62961	[.103]
D26	.153449E-02	.124717E-02	1.23037	[.219]
G2727	-.046442	.217519E-02	-21.3507	[.000]
A27	.077962	.024243	3.21587	[.001]
B27	-.466480E-02	.157791E-02	-2.95632	[.003]
D27	-.737485E-03	.193726E-02	-.380685	[.703]
G2828	-.029270	.323520E-02	-9.04740	[.000]
A28	.115202	.034130	3.37541	[.001]
B28	-.205658E-02	.207145E-02	-.992823	[.321]
D28	-.319956E-03	.275567E-02	-.116108	[.908]
G2929	-.031524	.253476E-02	-12.4367	[.000]
A29	.058914	.024986	2.35794	[.018]
B29	-.222459E-02	.166711E-02	-1.33440	[.182]
D29	.183905E-02	.207447E-02	.886513	[.375]
G3030	-.033741	.184248E-02	-18.3128	[.000]
A30	.062405	.015572	4.00761	[.000]
B30	-.227156E-02	.864900E-03	-2.62639	[.009]
D30	.412343E-04	.112219E-02	.036745	[.971]
G3131	-.035652	.313827E-02	-11.3603	[.000]
A31	.074848	.016798	4.45582	[.000]
B31	-.945296E-03	.906686E-03	-1.04258	[.297]

D31	-.347296E-03	.111093E-02	-.312619	[.755]
G3232	-.029567	.177547E-02	-16.6531	[.000]
A32	.051181	.019751	2.59138	[.010]
B32	-.126435E-02	.115420E-02	-1.09543	[.273]
D32	-.146451E-02	.152308E-02	-.961542	[.336]
G3333	-.063999	.331352E-02	-19.3147	[.000]
A33	-.010500	.021123	-.497096	[.619]
B33	-.142087E-02	.101685E-02	-1.39733	[.162]
D33	-.109926E-02	.134049E-02	-.820043	[.412]
G3434	-.092735	.576106E-02	-16.0969	[.000]
A34	-.057118	.024759	-2.30691	[.021]
B34	-.191238E-02	.114666E-02	-1.66778	[.095]
D34	.253071E-02	.151200E-02	1.67375	[.094]
G3535	-.063508	.350007E-02	-18.1448	[.000]
A35	.019431	.023037	.843450	[.399]
B35	-.256608E-02	.115756E-02	-2.21681	[.027]
D35	.496974E-03	.153086E-02	.324637	[.745]
G3636	-.036164	.306244E-02	-11.8087	[.000]
A36	.040013	.027907	1.43379	[.152]
B36	.146830E-02	.157018E-02	.935120	[.350]
D36	-.132063E-02	.203013E-02	-.650514	[.515]
G3737	-.015602	.151181E-02	-10.3199	[.000]
A37	.156373	.023082	6.77479	[.000]
B37	-.137991E-02	.136722E-02	-1.00928	[.313]
D37	-.516370E-03	.180270E-02	-.286443	[.775]
G3838	-.059869	.020150	-2.97117	[.003]
A38	-.053981	.020321	-2.65640	[.008]
B38	-.282771E-02	.115850E-02	-2.44083	[.015]
D38	.122085E-02	.148133E-02	.824157	[.410]
G3939	-.086983	.515403E-02	-16.8768	[.000]
A39	-.078072	.019415	-4.02117	[.000]
B39	-.392134E-03	.912866E-03	-.429563	[.668]
D39	.218552E-02	.118893E-02	1.83823	[.066]
G4040	-.119580	.555702E-02	-21.5188	[.000]
A40	-.269591	.025638	-10.5151	[.000]
B40	.651389E-03	.940099E-03	.692895	[.488]
D40	.101957E-02	.122574E-02	.831800	[.406]
G4141	-.035856	.020093	-1.78452	[.074]
A41	.019793	.015644	1.26522	[.206]
B41	-.285909E-02	.863583E-03	-3.31073	[.001]
D41	.904025E-03	.104099E-02	.868430	[.385]
G4242	-.082431	.474663E-02	-17.3661	[.000]
A42	-.086805	.017543	-4.94825	[.000]
B42	.478782E-03	.816467E-03	.586407	[.558]
D42	.229745E-02	.105647E-02	2.17464	[.030]
G4343	-.070953	.395983E-02	-17.9181	[.000]
A43	-.059617	.018676	-3.19222	[.001]
B43	-.724869E-03	.840494E-03	-.862433	[.388]
D43	.240418E-02	.109713E-02	2.19133	[.028]
G4444	-.098133	.686333E-02	-14.2982	[.000]
A44	-.160467	.034318	-4.67587	[.000]
B44	.645813E-02	.148906E-02	4.33705	[.000]
D44	.126637E-02	.187139E-02	.676697	[.499]

SPECIFICATION #14

L0 = coefficient for WF*WB*lnPj

L1 = coefficient for WF*WB*SUJD*lnPj
L2 = coefficient for WF*WB*(SUJD^2)*lnPj
L3 = coefficient for WF*WB*(SUJD^3)*lnPj
L4 = coefficient for WF*WB*(SUJD^4)*lnPj
L5 = coefficient for WF*(1 – WB)*lnPj
L6 = coefficient for WF*(1 – WB)*SUJD*lnPj
L7 = coefficient for WF*(1 – WB)*(SUJD^2)*lnPj
L8 = coefficient for WF*(1 – WB)*(SUJD^3)*lnPj
L9 = coefficient for WF*(1 – WB)*(SUJD^4)*lnPj
L10 = coefficient for (1 – WF)*WB*lnPj
L11 = coefficient for (1 – WF)*WB*SUJD*lnPj
L12 = coefficient for (1 – WF)*WB*(SUJD^2)*lnPj
L13 = coefficient for (1 – WF)*WB*(SUJD^3)*lnPj
L14 = coefficient for (1 – WF)*WB*(SUJD^4)*lnPj
L15 = coefficient for (1 – WF)*(1 – WB)*lnPj
L16 = coefficient for (1 – WF)*(1 – WB)*SUJD*lnPj
L17 = coefficient for (1 – WF)*(1 – WB)*(SUJD^2)*lnPj
L18 = coefficient for (1 – WF)*(1 – WB)*(SUJD^3)*lnPj
L19 = coefficient for (1 – WF)*(1 – WB)*(SUJD^4)*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	-.847822E-02	.883510E-03	-9.59607	[.000]
L1	.470717	.049704	9.47043	[.000]
L2	-6.29309	.669578	-9.39859	[.000]
L3	23.5743	2.49969	9.43088	[.000]
L4	-18.7086	1.97212	-9.48655	[.000]
L5	.381816E-02	.248915E-03	15.3392	[.000]
L6	-.065320	.016470	-3.96592	[.000]
L7	1.88551	.315177	5.98238	[.000]
L8	-8.10860	1.45986	-5.55439	[.000]
L9	9.43431	1.87801	5.02356	[.000]
L10	.493762E-03	.215364E-03	2.29268	[.022]
L11	.806225E-02	.010717	.752264	[.452]
L12	-.323491	.102009	-3.17119	[.002]
L13	1.30838	.278300	4.70131	[.000]
L14	-1.22281	.219731	-5.56503	[.000]
L15	.975185E-03	.129123E-03	7.55239	[.000]
L16	-.028167	.010479	-2.68793	[.007]
L17	1.57916	.218284	7.23440	[.000]
L18	-12.1403	1.49877	-8.10019	[.000]
L19	22.7267	2.91505	7.79633	[.000]
G11	-.342576	.951305E-02	-36.0111	[.000]
A1	-.026312	.139424	-.188718	[.850]
B1	-.052034	.915568E-02	-5.68321	[.000]
D1	.014037	.012031	1.16678	[.243]
RHO	.815877	.011743	69.4774	[.000]
G22	-.273412	.888609E-02	-30.7685	[.000]
A2	-.036236	.069439	-.521844	[.602]
B2	-.034330	.420620E-02	-8.16176	[.000]
D2	-.544292E-02	.561654E-02	-.969089	[.333]
G33	-.377285	.979941E-02	-38.5008	[.000]
A3	-.176090	.101472	-1.73536	[.083]
B3	-.052266	.714828E-02	-7.31166	[.000]
D3	.012324	.875828E-02	1.40708	[.159]
G44	-.126197	.714568E-02	-17.6606	[.000]
A4	.023545	.071586	.328899	[.742]
B4	-.015946	.490155E-02	-3.25323	[.001]
D4	.141481E-02	.616357E-02	.229544	[.818]
G55	-.259211	.028512	-9.09135	[.000]

A5	-.367452	.090272	-4.07051	[.000]
B5	-.013700	.237990E-02	-5.75647	[.000]
D5	-.733666E-02	.316465E-02	-2.31832	[.020]
G66	-.089338	.439803E-02	-20.3131	[.000]
A6	.024165	.047454	.509229	[.611]
B6	-.784081E-02	.282724E-02	-2.77331	[.006]
D6	-.552001E-02	.372560E-02	-1.48164	[.138]
G77	-.137853	.659724E-02	-20.8955	[.000]
A7	-.076607	.044429	-1.72426	[.085]
B7	-.010202	.242405E-02	-4.20861	[.000]
D7	-.104404E-02	.322768E-02	-.323465	[.746]
G88	-.374052	.773921E-02	-48.3320	[.000]
A8	-.748165	.159227	-4.69875	[.000]
B8	-.013200	.010432	-1.26534	[.206]
D8	.010136	.013715	.739083	[.460]
G99	-.090654	.281015E-02	-32.2593	[.000]
A9	.036306	.024504	1.48162	[.138]
B9	-.896015E-02	.143152E-02	-6.25921	[.000]
D9	-.272332E-02	.189170E-02	-1.43962	[.150]
G1010	-.100148	.324787E-02	-30.8350	[.000]
A10	-.016982	.029531	-.575066	[.565]
B10	-.722524E-02	.176242E-02	-4.09961	[.000]
D10	-.484863E-02	.233874E-02	-2.07318	[.038]
G1111	-.079985	.318683E-02	-25.0986	[.000]
A11	.019040	.031545	.603559	[.546]
B11	-.871704E-02	.211914E-02	-4.11347	[.000]
D11	-.632569E-03	.264904E-02	-.238791	[.811]
G1212	-.106879	.403608E-02	-26.4808	[.000]
A12	.073212	.049802	1.47006	[.142]
B12	-.010973	.292680E-02	-3.74921	[.000]
D12	.218536E-02	.388874E-02	.561971	[.574]
G1313	-.064325	.370291E-02	-17.3714	[.000]
A13	.027804	.039164	.709935	[.478]
B13	-.433626E-02	.267444E-02	-1.62137	[.105]
D13	.953679E-03	.329667E-02	.289286	[.772]
G1414	-.308642	.883287E-02	-34.9424	[.000]
A14	-.996046	.105012	-9.48504	[.000]
B14	.014661	.707831E-02	2.07130	[.038]
D14	-.724267E-02	.907731E-02	-.797888	[.425]
G1515	-.079284	.326763E-02	-24.2634	[.000]
A15	-.061702	.041198	-1.49768	[.134]
B15	-.534565E-02	.273590E-02	-1.95389	[.051]
D15	-.182873E-02	.349509E-02	-.523229	[.601]
G1616	-.110338	.020410	-5.40611	[.000]
A16	-.073268	.064572	-1.13467	[.257]
B16	-.492246E-02	.160729E-02	-3.06258	[.002]
D16	.140981E-02	.212822E-02	.662435	[.508]
G1717	-.081024	.235841E-02	-34.3552	[.000]
A17	.069082	.028268	2.44383	[.015]
B17	-.724681E-02	.190504E-02	-3.80402	[.000]
D17	.190491E-02	.228509E-02	.833624	[.404]
G1818	-.078800	.533765E-02	-14.7631	[.000]
A18	-.082040	.044755	-1.83308	[.067]
B18	-.230480E-02	.253673E-02	-.908568	[.364]
D18	-.457226E-02	.334701E-02	-1.36607	[.172]
G1919	-.136369	.020857	-6.53815	[.000]
A19	-.090191	.111847	-.806374	[.420]
B19	-.188316E-02	.581045E-02	-.324098	[.746]
D19	-.021864	.759547E-02	-2.87852	[.004]
G2020	-.093850	.286455E-02	-32.7628	[.000]
A20	-.063504	.025175	-2.52244	[.012]

B20	-.598988E-02	.153047E-02	-3.91376	[.000]
D20	-.118351E-02	.193745E-02	-.610859	[.541]
G2121	-.045610	.238157E-02	-19.1514	[.000]
A21	.084545	.022857	3.69890	[.000]
B21	-.522725E-02	.135836E-02	-3.84821	[.000]
D21	-.193792E-02	.179368E-02	-1.08041	[.280]
G2222	-.822788E-02	.603351E-02	-1.36370	[.173]
A22	.161663	.059941	2.69706	[.007]
B22	-.560161E-03	.250069E-02	-.224003	[.823]
D22	-.307810E-02	.335743E-02	-.916803	[.359]
G2323	-.035677	.856382E-02	-4.16604	[.000]
A23	.240445	.049041	4.90292	[.000]
B23	.394290E-02	.319589E-02	1.23374	[.217]
D23	.283099E-02	.403655E-02	.701338	[.483]
G2424	-.016374	.254262E-02	-6.43993	[.000]
A24	.091159	.030648	2.97440	[.003]
B24	.221905E-03	.181628E-02	.122175	[.903]
D24	-.144325E-02	.238797E-02	-.604381	[.546]
G2525	-.048557	.254372E-02	-19.0891	[.000]
A25	.851835E-02	.026492	.321546	[.748]
B25	-.119778E-02	.161229E-02	-.742905	[.458]
D25	-.965977E-03	.213172E-02	-.453144	[.650]
G2626	-.116351	.566851E-02	-20.5259	[.000]
A26	-.252767	.026087	-9.68938	[.000]
B26	-.177683E-02	.953960E-03	-1.86259	[.063]
D26	.137360E-02	.124293E-02	1.10513	[.269]
G2727	-.044380	.240231E-02	-18.4740	[.000]
A27	.082622	.024462	3.37751	[.001]
B27	-.440361E-02	.158627E-02	-2.77607	[.006]
D27	-.470292E-03	.193454E-02	-.243102	[.808]
G2828	-.025005	.347146E-02	-7.20309	[.000]
A28	.114797	.034295	3.34733	[.001]
B28	-.226888E-02	.206668E-02	-1.09784	[.272]
D28	-.339851E-03	.273771E-02	-.124137	[.901]
G2929	-.036040	.250710E-02	-14.3751	[.000]
A29	.064034	.025745	2.48729	[.013]
B29	-.222469E-02	.170451E-02	-1.30518	[.192]
D29	.167460E-02	.211705E-02	.791004	[.429]
G3030	-.044861	.159779E-02	-28.0767	[.000]
A30	.070192	.014744	4.76068	[.000]
B30	-.265256E-02	.782768E-03	-3.38870	[.001]
D30	.316269E-03	.100276E-02	.315398	[.752]
G3131	-.051268	.404644E-02	-12.6699	[.000]
A31	.074696	.019085	3.91377	[.000]
B31	-.757184E-03	.105298E-02	-.719086	[.472]
D31	-.767787E-03	.128402E-02	-.597954	[.550]
G3232	-.030612	.180728E-02	-16.9383	[.000]
A32	.054573	.019444	2.80666	[.005]
B32	-.147492E-02	.111879E-02	-1.31832	[.187]
D32	-.160174E-02	.146769E-02	-1.09133	[.275]
G3333	-.057379	.318824E-02	-17.9971	[.000]
A33	.021947	.021538	1.01901	[.308]
B33	-.115594E-02	.104779E-02	-1.10322	[.270]
D33	-.787965E-03	.137310E-02	-.573859	[.566]
G3434	-.100579	.629082E-02	-15.9883	[.000]
A34	-.036607	.027098	-1.35092	[.177]
B34	-.116274E-02	.124171E-02	-.936406	[.349]
D34	.281425E-02	.162811E-02	1.72854	[.084]
G3535	-.061793	.366550E-02	-16.8579	[.000]
A35	.241700E-03	.023090	.010468	[.992]
B35	-.272127E-02	.111070E-02	-2.45004	[.014]

D35	.406538E-03	.145930E-02	.278584	[.781]
G3636	-.028778	.275362E-02	-10.4509	[.000]
A36	.040146	.025816	1.55505	[.120]
B36	.508756E-03	.146488E-02	.347303	[.728]
D36	-.158160E-02	.187434E-02	-.843818	[.399]
G3737	-.011394	.178611E-02	-6.37950	[.000]
A37	.171544	.023828	7.19915	[.000]
B37	-.158746E-02	.138631E-02	-1.14510	[.252]
D37	-.574014E-03	.181953E-02	-.315473	[.752]
G3838	.345342E-02	.021041	.164130	[.870]
A38	-.065932	.019858	-3.32021	[.001]
B38	-.217372E-02	.115210E-02	-1.88675	[.059]
D38	.150955E-02	.142890E-02	1.05644	[.291]
G3939	-.180488	.010867	-16.6086	[.000]
A39	-.070887	.021361	-3.31850	[.001]
B39	.577629E-03	.102307E-02	.564603	[.572]
D39	.230935E-02	.132475E-02	1.74323	[.081]
G4040	-.117741	.515839E-02	-22.8252	[.000]
A40	-.276544	.025216	-10.9671	[.000]
B40	.530262E-03	.959856E-03	.552439	[.581]
D40	.622307E-03	.124512E-02	.499798	[.617]
G4141	.033957	.021058	1.61253	[.107]
A41	.031708	.017231	1.84017	[.066]
B41	-.339009E-02	.948138E-03	-3.57552	[.000]
D41	.968979E-03	.112818E-02	.858888	[.390]
G4242	-.164647	.010392	-15.8439	[.000]
A42	-.077111	.019532	-3.94787	[.000]
B42	.154777E-02	.896723E-03	1.72602	[.084]
D42	.270944E-02	.115151E-02	2.35295	[.019]
G4343	-.072028	.424613E-02	-16.9631	[.000]
A43	-.058861	.019741	-2.98172	[.003]
B43	-.634971E-03	.865499E-03	-.733647	[.463]
D43	.260232E-02	.112352E-02	2.31622	[.021]
G4444	-.095226	.634225E-02	-15.0146	[.000]
A44	-.140253	.032939	-4.25792	[.000]
B44	.562477E-02	.147567E-02	3.81167	[.000]
D44	.129839E-02	.184156E-02	.705050	[.481]

SPECIFICATION #15

L0 = coefficient for WF*WT*lnPj
L1 = coefficient for WF*WT*SUJD*lnPj
L2 = coefficient for WF*(1 – WT)*lnPj
L3 = coefficient for WF*(1 – WT)*SUJD*lnPj
L4 = coefficient for (1 – WF)*WT*lnPj
L5 = coefficient for (1 – WF)*WT*SUJD*lnPj
L6 = coefficient for (1 – WF)*(1 – WT)*lnPj
L7 = coefficient for (1 – WF)*(1 – WT)*SUJD*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.242605E-02	.226815E-03	10.6962	[.000]
L1	.019187	.331087E-02	5.79520	[.000]
L2	-.262847E-03	.381901E-03	-.688259	[.491]
L3	-.010875	.025269	-.430359	[.667]
L4	.124658E-02	.105456E-03	11.8208	[.000]
L5	-.485292E-02	.888240E-03	-5.46352	[.000]

L6	.464531E-03	.170238E-03	2.72872	[.006]
L7	.878933E-02	.899690E-02	.976928	[.329]
G11	-.343633	.902129E-02	-38.0914	[.000]
A1	-.070591	.137133	-.514762	[.607]
B1	-.055205	.899269E-02	-6.13890	[.000]
D1	.014338	.011964	1.19842	[.231]
RHO	.826547	.011084	74.5725	[.000]
G22	-.276113	.790581E-02	-34.9253	[.000]
A2	-.013496	.067853	-.198905	[.842]
B2	-.034578	.419432E-02	-8.24390	[.000]
D2	-.520749E-02	.565488E-02	-.920883	[.357]
G33	-.388833	.948069E-02	-41.0132	[.000]
A3	-.189207	.101266	-1.86841	[.062]
B3	-.054588	.707870E-02	-7.71156	[.000]
D3	.013515	.881409E-02	1.53337	[.125]
G44	-.137016	.755949E-02	-18.1251	[.000]
A4	-.970027E-03	.072385	-.013401	[.989]
B4	-.017902	.498082E-02	-3.59422	[.000]
D4	.525312E-03	.631301E-02	.083211	[.934]
G55	-.252454	.026912	-9.38061	[.000]
A5	-.322777	.086138	-3.74719	[.000]
B5	-.014041	.234920E-02	-5.97707	[.000]
D5	-.767741E-02	.315156E-02	-2.43607	[.015]
G66	-.105300	.438543E-02	-24.0112	[.000]
A6	.046946	.049043	.957231	[.338]
B6	-.765266E-02	.294763E-02	-2.59621	[.009]
D6	-.538403E-02	.393125E-02	-1.36955	[.171]
G77	-.144011	.547199E-02	-26.3179	[.000]
A7	-.097329	.042556	-2.28707	[.022]
B7	-.011456	.239893E-02	-4.77553	[.000]
D7	-.138680E-02	.321992E-02	-.430694	[.667]
G88	-.373902	.771601E-02	-48.4580	[.000]
A8	-.782140	.165864	-4.71554	[.000]
B8	-.015663	.010891	-1.43817	[.150]
D8	.011457	.014489	.790752	[.429]
G99	-.107411	.266431E-02	-40.3148	[.000]
A9	.056402	.025831	2.18349	[.029]
B9	-.919927E-02	.152454E-02	-6.03415	[.000]
D9	-.268560E-02	.204348E-02	-1.31423	[.189]
G1010	-.115013	.302186E-02	-38.0604	[.000]
A10	.012588	.029023	.433716	[.664]
B10	-.769056E-02	.174930E-02	-4.39635	[.000]
D10	-.509566E-02	.234867E-02	-2.16959	[.030]
G1111	-.087224	.272945E-02	-31.9567	[.000]
A11	-.018147	.031677	-.572867	[.567]
B11	-.981969E-02	.207346E-02	-4.73589	[.000]
D11	-.845433E-03	.266402E-02	-.317352	[.751]
G1212	-.103812	.433054E-02	-23.9721	[.000]
A12	.228929E-02	.049150	.046578	[.963]
B12	-.012514	.294348E-02	-4.25149	[.000]
D12	.673511E-03	.394372E-02	.170780	[.864]
G1313	-.065712	.342896E-02	-19.1637	[.000]
A13	-.027689	.040410	-.685198	[.493]
B13	-.491383E-02	.268667E-02	-1.82897	[.067]
D13	.102563E-02	.341195E-02	.300599	[.764]
G1414	-.322189	.845259E-02	-38.1173	[.000]
A14	-.989511	.105364	-9.39134	[.000]
B14	.708202E-02	.703936E-02	1.00606	[.314]
D14	-.751627E-02	.919870E-02	-.817101	[.414]
G1515	-.087444	.330884E-02	-26.4275	[.000]
A15	-.063585	.040397	-1.57399	[.115]

B15	-.578048E-02	.267328E-02	-2.16232	[.031]
D15	-.106897E-02	.342671E-02	-.311952	[.755]
G1616	-.150911	.018795	-8.02950	[.000]
A16	-.180183	.060820	-2.96258	[.003]
B16	-.574622E-02	.162060E-02	-3.54573	[.000]
D16	.130666E-02	.216178E-02	.604437	[.546]
G1717	-.090770	.173647E-02	-52.2726	[.000]
A17	.059218	.024737	2.39391	[.017]
B17	-.990299E-02	.156946E-02	-6.30979	[.000]
D17	.252883E-02	.197443E-02	1.28079	[.200]
G1818	-.098005	.545936E-02	-17.9517	[.000]
A18	-.065097	.044143	-1.47470	[.140]
B18	-.240528E-02	.248588E-02	-.967577	[.333]
D18	-.456500E-02	.331256E-02	-1.37809	[.168]
G1919	-.147198	.022091	-6.66314	[.000]
A19	-.169063	.114097	-1.48175	[.138]
B19	-.388684E-02	.577301E-02	-.673277	[.501]
D19	-.021265	.774047E-02	-2.74722	[.006]
G2020	-.095204	.272886E-02	-34.8878	[.000]
A20	-.142990	.022924	-6.23751	[.000]
B20	-.414167E-02	.126137E-02	-3.28346	[.001]
D20	-.588507E-03	.166322E-02	-.353836	[.723]
G2121	-.048615	.195301E-02	-24.8925	[.000]
A21	.119184	.022560	5.28292	[.000]
B21	-.529702E-02	.131549E-02	-4.02666	[.000]
D21	-.189276E-02	.175972E-02	-1.07560	[.282]
G2222	-.013911	.585681E-02	-2.37523	[.018]
A22	.082221	.060121	1.36759	[.171]
B22	-.167210E-02	.249795E-02	-.669389	[.503]
D22	-.434361E-02	.338277E-02	-1.28404	[.199]
G2323	-.043182	.669880E-02	-6.44623	[.000]
A23	.262464	.044741	5.86636	[.000]
B23	.850785E-04	.277285E-02	.030683	[.976]
D23	.312297E-02	.365952E-02	.853384	[.393]
G2424	-.024525	.395550E-02	-6.20030	[.000]
A24	.152043	.043025	3.53386	[.000]
B24	-.311030E-02	.254813E-02	-1.22062	[.222]
D24	-.160662E-02	.340240E-02	-.472203	[.637]
G2525	-.064100	.162719E-02	-39.3928	[.000]
A25	.055108	.021806	2.52720	[.011]
B25	-.210953E-02	.129973E-02	-1.62305	[.105]
D25	-.140405E-02	.173601E-02	-.808777	[.419]
G2626	-.115743	.573493E-02	-20.1822	[.000]
A26	-.230760	.026965	-8.55777	[.000]
B26	-.274358E-02	.957895E-03	-2.86417	[.004]
D26	.992799E-03	.126053E-02	.787602	[.431]
G2727	-.049594	.203326E-02	-24.3916	[.000]
A27	-.014709	.023508	-.625703	[.532]
B27	-.464459E-02	.145165E-02	-3.19952	[.001]
D27	-.167623E-02	.182596E-02	-.918000	[.359]
G2828	-.034714	.344548E-02	-10.0753	[.000]
A28	.099306	.034495	2.87888	[.004]
B28	-.194455E-02	.206237E-02	-.942869	[.346]
D28	-.905308E-03	.276221E-02	-.327747	[.743]
G2929	-.040836	.239423E-02	-17.0558	[.000]
A29	.020055	.026550	.755382	[.450]
B29	-.272964E-02	.172951E-02	-1.57827	[.115]
D29	.161369E-02	.219103E-02	.736500	[.461]
G3030	-.054152	.213390E-02	-25.3772	[.000]
A30	.088210	.018645	4.73109	[.000]
B30	-.297588E-02	.101246E-02	-2.93925	[.003]

D30	.705149E-03	.133983E-02	.526296	[.599]
G3131	-.022009	.254317E-02	-8.65427	[.000]
A31	.027304	.015960	1.71080	[.087]
B31	-.192284E-02	.691816E-03	-2.77942	[.005]
D31	-.315159E-03	.889805E-03	-.354189	[.723]
G3232	-.041035	.170665E-02	-24.0443	[.000]
A32	.099578	.018849	5.28293	[.000]
B32	-.144091E-02	.105255E-02	-1.36897	[.171]
D32	-.148960E-02	.139893E-02	-1.06482	[.287]
G3333	-.069133	.316847E-02	-21.8191	[.000]
A33	-.011539	.022185	-.520128	[.603]
B33	-.212193E-02	.108937E-02	-1.94786	[.051]
D33	-.130756E-02	.143706E-02	-.909885	[.363]
G3434	-.090017	.601893E-02	-14.9557	[.000]
A34	-.080221	.026139	-3.06898	[.002]
B34	-.383548E-02	.114963E-02	-3.33628	[.001]
D34	.241640E-02	.151663E-02	1.59327	[.111]
G3535	-.072895	.309617E-02	-23.5437	[.000]
A35	-.148692E-02	.021877	-.067967	[.946]
B35	-.269484E-02	.108345E-02	-2.48727	[.013]
D35	.116183E-03	.144144E-02	.080602	[.936]
G3636	-.048751	.265448E-02	-18.3654	[.000]
A36	.041248	.026819	1.53800	[.124]
B36	-.859330E-03	.150615E-02	-.570546	[.568]
D36	-.129872E-02	.198519E-02	-.654203	[.513]
G3737	-.021683	.163636E-02	-13.2507	[.000]
A37	.132892	.022598	5.88063	[.000]
B37	-.241001E-02	.131450E-02	-1.83341	[.067]
D37	-.647677E-03	.173877E-02	-.372491	[.710]
G3838	-.090789	.384813E-02	-23.5930	[.000]
A38	-.103766	.020806	-4.98736	[.000]
B38	-.168402E-02	.111293E-02	-1.51314	[.130]
D38	.938366E-03	.145997E-02	.642731	[.520]
G3939	-.089871	.427670E-02	-21.0141	[.000]
A39	-.081928	.020559	-3.98508	[.000]
B39	-.285051E-02	.927598E-03	-3.07300	[.002]
D39	.181244E-02	.119940E-02	1.51113	[.131]
G4040	-.119497	.435891E-02	-27.4144	[.000]
A40	-.289166	.022803	-12.6811	[.000]
B40	-.134356E-02	.873618E-03	-1.53793	[.124]
D40	-.279164E-03	.112993E-02	-.247064	[.805]
G4141	-.065087	.363405E-02	-17.9103	[.000]
A41	-.026009	.016048	-1.62069	[.105]
B41	-.137373E-02	.805266E-03	-1.70593	[.088]
D41	.936948E-03	.101683E-02	.921443	[.357]
G4242	-.089122	.360271E-02	-24.7373	[.000]
A42	-.090641	.018526	-4.89254	[.000]
B42	-.199668E-02	.836850E-03	-2.38595	[.017]
D42	.196977E-02	.107247E-02	1.83666	[.066]
G4343	-.077324	.397519E-02	-19.4516	[.000]
A43	-.067522	.019736	-3.42126	[.001]
B43	-.141729E-02	.866015E-03	-1.63657	[.102]
D43	.230260E-02	.112571E-02	2.04547	[.041]
G4444	-.100506	.764929E-02	-13.1393	[.000]
A44	-.180178	.035315	-5.10196	[.000]
B44	.364453E-02	.131413E-02	2.77335	[.006]
D44	.131344E-02	.168630E-02	.778888	[.436]

SPECIFICATION #16

```
L0  = coefficient for   WF*WT*lnPj
L1  = coefficient for   WF*WT*SUJD*lnPj
L2  = coefficient for   WF*WT*(SUJD^2)*lnPj
L3  = coefficient for   WF*(1 – WT)*lnPj
L4  = coefficient for   WF*(1 – WT)*SUJD*lnPj
L5  = coefficient for   WF*(1 – WT)*(SUJD^2)*lnPj
L6  = coefficient for   (1 – WF)*WT*lnPj
L7  = coefficient for   (1 – WF)*WT*SUJD*lnPj
L8  = coefficient for   (1 – WF)*WT*(SUJD^2)*lnPj
L9  = coefficient for   (1 – WF)*(1 – WT)*lnPj
L10 = coefficient for   (1 – WF)*(1 – WT)*SUJD*lnPj
L11 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^2)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.843938E-03	.213753E-03	3.94819	[.000]
L1	.070602	.613343E-02	11.5111	[.000]
L2	-.132456	.019171	-6.90911	[.000]
L3	-.101346E-02	.105581E-02	-.959889	[.337]
L4	.292991	.236760	1.23750	[.216]
L5	-8.65494	6.90965	-1.25259	[.210]
L6	.123731E-02	.117260E-03	10.5518	[.000]
L7	-.382349E-02	.212190E-02	-1.80192	[.072]
L8	-.513373E-02	.379430E-02	-1.35301	[.176]
L9	-.297909E-03	.211350E-03	-1.40956	[.159]
L10	.175248	.030197	5.80346	[.000]
L11	-6.18701	1.03326	-5.98783	[.000]
G11	-.341953	.881459E-02	-38.7939	[.000]
A1	-.054549	.137815	-.395810	[.692]
B1	-.054318	.903041E-02	-6.01503	[.000]
D1	.014312	.012026	1.19008	[.234]
RHO	.827130	.010205	81.0492	[.000]
G22	-.279278	.820199E-02	-34.0500	[.000]
A2	-.023862	.068365	-.349041	[.727]
B2	-.034071	.420674E-02	-8.09919	[.000]
D2	-.512914E-02	.567544E-02	-.903742	[.366]
G33	-.387038	.932974E-02	-41.4843	[.000]
A3	-.192258	.102838	-1.86953	[.062]
B3	-.052922	.715365E-02	-7.39789	[.000]
D3	.013639	.894909E-02	1.52408	[.127]
G44	-.133670	.753008E-02	-17.7515	[.000]
A4	.612479E-02	.073260	.083603	[.933]
B4	-.017485	.503324E-02	-3.47385	[.001]
D4	.995996E-03	.638932E-02	.155884	[.876]
G55	-.247097	.025703	-9.61335	[.000]
A5	-.308528	.083191	-3.70865	[.000]
B5	-.014207	.234456E-02	-6.05972	[.000]
D5	-.774122E-02	.314720E-02	-2.45971	[.014]
G66	-.102267	.459773E-02	-22.2429	[.000]
A6	.054374	.048822	1.11374	[.265]
B6	-.722370E-02	.292325E-02	-2.47112	[.013]
D6	-.514393E-02	.389347E-02	-1.32117	[.186]
G77	-.140746	.528743E-02	-26.6191	[.000]
A7	-.093042	.043238	-2.15188	[.031]
B7	-.011667	.246580E-02	-4.73168	[.000]
D7	-.178518E-02	.331148E-02	-.539089	[.590]
G88	-.369384	.758078E-02	-48.7263	[.000]
A8	-.798859	.162851	-4.90546	[.000]

B8	-.014192	.010678	-1.32916	[.184]
D8	.011191	.014212	.787473	[.431]
G99	-.115111	.287052E-02	-40.1011	[.000]
A9	.050555	.026206	1.92916	[.054]
B9	-.888599E-02	.152700E-02	-5.81925	[.000]
D9	-.269538E-02	.204736E-02	-1.31652	[.188]
G1010	-.122227	.324364E-02	-37.6822	[.000]
A10	.719757E-02	.029936	.240429	[.810]
B10	-.766197E-02	.178879E-02	-4.28333	[.000]
D10	-.525355E-02	.240421E-02	-2.18514	[.029]
G1111	-.086581	.286672E-02	-30.2022	[.000]
A11	-.013486	.031272	-.431244	[.666]
B11	-.975285E-02	.207782E-02	-4.69380	[.000]
D11	-.772371E-03	.265038E-02	-.291419	[.771]
G1212	-.104403	.458299E-02	-22.7806	[.000]
A12	.772891E-02	.049698	.155519	[.876]
B12	-.013639	.295170E-02	-4.62064	[.000]
D12	.237144E-03	.393423E-02	.060277	[.952]
G1313	-.065620	.337960E-02	-19.4164	[.000]
A13	-.012738	.040766	-.312470	[.755]
B13	-.506316E-02	.268848E-02	-1.88328	[.060]
D13	.116207E-02	.342213E-02	.339575	[.734]
G1414	-.321608	.814912E-02	-39.4654	[.000]
A14	-.996300	.105401	-9.45244	[.000]
B14	.884885E-02	.702524E-02	1.25958	[.208]
D14	-.714614E-02	.920410E-02	-.776408	[.438]
G1515	-.083389	.324595E-02	-25.6903	[.000]
A15	-.052905	.040376	-1.31033	[.190]
B15	-.507140E-02	.266313E-02	-1.90430	[.057]
D15	-.986651E-03	.342778E-02	-.287840	[.773]
G1616	-.145967	.019536	-7.47174	[.000]
A16	-.168911	.062867	-2.68678	[.007]
B16	-.590762E-02	.162458E-02	-3.63639	[.000]
D16	.130338E-02	.216945E-02	.600789	[.548]
G1717	-.091173	.191019E-02	-47.7298	[.000]
A17	.065234	.026686	2.44455	[.015]
B17	-.874822E-02	.170791E-02	-5.12217	[.000]
D17	.239444E-02	.214275E-02	1.11746	[.264]
G1818	-.096573	.532520E-02	-18.1352	[.000]
A18	-.068774	.043781	-1.57087	[.116]
B18	-.200252E-02	.247668E-02	-.808551	[.419]
D18	-.441848E-02	.330208E-02	-1.33809	[.181]
G1919	-.149796	.023331	-6.42048	[.000]
A19	-.173859	.115841	-1.50083	[.133]
B19	-.473823E-02	.567665E-02	-.834688	[.404]
D19	-.021776	.759455E-02	-2.86727	[.004]
G2020	-.096671	.258416E-02	-37.4093	[.000]
A20	-.146729	.023536	-6.23418	[.000]
B20	-.337517E-02	.130551E-02	-2.58532	[.010]
D20	-.260610E-03	.170630E-02	-.152734	[.879]
G2121	-.048617	.191997E-02	-25.3220	[.000]
A21	.115683	.022783	5.07757	[.000]
B21	-.486916E-02	.132721E-02	-3.66873	[.000]
D21	-.168981E-02	.177441E-02	-.952324	[.341]
G2222	-.016111	.618427E-02	-2.60515	[.009]
A22	.066274	.062989	1.05215	[.293]
B22	-.253112E-02	.254400E-02	-.994939	[.320]
D22	-.507775E-02	.344189E-02	-1.47528	[.140]
G2323	-.042840	.658200E-02	-6.50874	[.000]
A23	.266252	.046340	5.74559	[.000]
B23	.164763E-02	.290373E-02	.567417	[.570]

D23	.305449E-02	.382239E-02	.799106	[.424]
G2424	-.023511	.402494E-02	-5.84131	[.000]
A24	.152625	.042637	3.57963	[.000]
B24	-.326034E-02	.251623E-02	-1.29572	[.195]
D24	-.169524E-02	.335961E-02	-.504593	[.614]
G2525	-.070354	.174535E-02	-40.3094	[.000]
A25	.054021	.021558	2.50580	[.012]
B25	-.215282E-02	.126136E-02	-1.70675	[.088]
D25	-.159455E-02	.168367E-02	-.947067	[.344]
G2626	-.114989	.599685E-02	-19.1748	[.000]
A26	-.226614	.027864	-8.13297	[.000]
B26	-.259626E-02	.959345E-03	-2.70629	[.007]
D26	.101579E-02	.126010E-02	.806117	[.420]
G2727	-.050280	.203501E-02	-24.7077	[.000]
A27	-.040239	.022850	-1.76100	[.078]
B27	-.487921E-02	.142843E-02	-3.41577	[.001]
D27	-.206679E-02	.178171E-02	-1.16000	[.246]
G2828	-.034081	.334229E-02	-10.1969	[.000]
A28	.098619	.034730	2.83962	[.005]
B28	-.142092E-02	.208170E-02	-.682577	[.495]
D28	-.673763E-03	.278836E-02	-.241634	[.809]
G2929	-.041304	.243250E-02	-16.9799	[.000]
A29	.011874	.026339	.450829	[.652]
B29	-.284076E-02	.173520E-02	-1.63714	[.102]
D29	.155487E-02	.219857E-02	.707220	[.479]
G3030	-.056464	.235247E-02	-24.0022	[.000]
A30	.086968	.019355	4.49330	[.000]
B30	-.260771E-02	.105671E-02	-2.46775	[.014]
D30	.990592E-03	.139788E-02	.708636	[.479]
G3131	-.020438	.206361E-02	-9.90411	[.000]
A31	.016675	.014034	1.18819	[.235]
B31	-.215487E-02	.649816E-03	-3.31613	[.001]
D31	-.376938E-03	.811052E-03	-.464751	[.642]
G3232	-.039944	.156141E-02	-25.5821	[.000]
A32	.087293	.018409	4.74180	[.000]
B32	-.157563E-02	.102165E-02	-1.54224	[.123]
D32	-.154621E-02	.135691E-02	-1.13951	[.254]
G3333	-.069670	.325667E-02	-21.3931	[.000]
A33	-.038000	.022301	-1.70400	[.088]
B33	-.232519E-02	.107850E-02	-2.15595	[.031]
D33	-.171465E-02	.142374E-02	-1.20432	[.228]
G3434	-.085748	.511433E-02	-16.7663	[.000]
A34	-.086071	.024246	-3.54989	[.000]
B34	-.372097E-02	.113012E-02	-3.29256	[.001]
D34	.224693E-02	.149174E-02	1.50625	[.132]
G3535	-.069840	.364824E-02	-19.1436	[.000]
A35	.479365E-02	.022466	.213374	[.831]
B35	-.217609E-02	.105451E-02	-2.06359	[.039]
D35	.218532E-03	.140115E-02	.155967	[.876]
G3636	-.049403	.241897E-02	-20.4233	[.000]
A36	.034338	.025940	1.32373	[.186]
B36	-.905861E-03	.145991E-02	-.620491	[.535]
D36	-.137576E-02	.191852E-02	-.717097	[.473]
G3737	-.021248	.145568E-02	-14.5964	[.000]
A37	.124372	.022259	5.58763	[.000]
B37	-.243342E-02	.129656E-02	-1.87683	[.061]
D37	-.731496E-03	.171377E-02	-.426834	[.670]
G3838	-.020917	.012817	-1.63201	[.103]
A38	-.113538	.019507	-5.82038	[.000]
B38	-.166434E-02	.106217E-02	-1.56692	[.117]
D38	.928159E-03	.138549E-02	.669914	[.503]

G3939	-.089570	.418816E-02	-21.3865	[.000]
A39	-.082850	.020354	-4.07055	[.000]
B39	-.264542E-02	.927486E-03	-2.85225	[.004]
D39	.186262E-02	.120083E-02	1.55111	[.121]
G4040	-.118983	.445092E-02	-26.7323	[.000]
A40	-.283945	.023569	-12.0472	[.000]
B40	-.118503E-02	.931135E-03	-1.27267	[.203]
D40	-.294599E-03	.115136E-02	-.255870	[.798]
G4141	.328127E-02	.012727	.257821	[.797]
A41	-.038723	.016106	-2.40435	[.016]
B41	-.151681E-02	.819043E-03	-1.85193	[.064]
D41	.681337E-03	.103297E-02	.659588	[.510]
G4242	-.089985	.359051E-02	-25.0619	[.000]
A42	-.092484	.018447	-5.01347	[.000]
B42	-.179746E-02	.837098E-03	-2.14725	[.032]
D42	.203298E-02	.107426E-02	1.89245	[.058]
G4343	-.077932	.374024E-02	-20.8362	[.000]
A43	-.069327	.019484	-3.55821	[.000]
B43	-.156307E-02	.865048E-03	-1.80692	[.071]
D43	.229977E-02	.112785E-02	2.03908	[.041]
G4444	-.103919	.735356E-02	-14.1318	[.000]
A44	-.193732	.035253	-5.49551	[.000]
B44	.480219E-02	.139341E-02	3.44637	[.001]
D44	.135356E-02	.179111E-02	.755711	[.450]

SPECIFICATION #17

```
L0  = coefficient for   WF*WT*lnPj
L1  = coefficient for   WF*WT*SUJD*lnPj
L2  = coefficient for   WF*WT*(SUJD^2)*lnPj
L3  = coefficient for   WF*WT*(SUJD^3)*lnPj
L4  = coefficient for   WF*(1 – WT)*lnPj
L5  = coefficient for   WF*(1 – WT)*SUJD*lnPj
L6  = coefficient for   WF*(1 – WT)*(SUJD^2)*lnPj
L7  = coefficient for   WF*(1 – WT)*(SUJD^3)*lnPj
L8  = coefficient for   (1 – WF)*WT*lnPj
L9  = coefficient for   (1 – WF)*WT*SUJD*lnPj
L10 = coefficient for   (1 – WF)*WT*(SUJD^2)*lnPj
L11 = coefficient for   (1 – WF)*WT*(SUJD^3)*lnPj
L12 = coefficient for   (1 – WF)*(1 – WT)*lnPj
L13 = coefficient for   (1 – WF)*(1 – WT)*SUJD*lnPj
L14 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^2)*lnPj
L15 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^3)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.150705E-02	.235567E-03	6.39752	[.000]
L1	.037920	.908609E-02	4.17343	[.000]
L2	.087338	.051953	1.68111	[.093]
L3	-.326306	.066856	-4.88070	[.000]
L4	-.155265E-02	.303295E-02	-.511926	[.609]
L5	.480433	.853945	.562605	[.574]
L6	-22.9438	54.7414	-.419130	[.675]

L7	276.373	995.953	.277496	[.781]
L8	.124883E-02	.123262E-03	10.1315	[.000]
L9	-.469151E-02	.394794E-02	-1.18834	[.235]
L10	.110177E-02	.020636	.053392	[.957]
L11	-.910066E-02	.023603	-.385573	[.700]
L12	.625891E-03	.451414E-03	1.38651	[.166]
L13	-.085196	.113602	-.749951	[.453]
L14	11.7326	7.59597	1.54458	[.122]
L15	-347.861	148.109	-2.34868	[.019]
G11	-.342815	.902902E-02	-37.9681	[.000]
A1	-.055742	.138273	-.403128	[.687]
B1	-.054532	.906254E-02	-6.01730	[.000]
D1	.014424	.012072	1.19487	[.232]
RHO	.827895	.010063	82.2703	[.000]
G22	-.276993	.811452E-02	-34.1354	[.000]
A2	-.017284	.068157	-.253590	[.800]
B2	-.034290	.419770E-02	-8.16882	[.000]
D2	-.509728E-02	.566596E-02	-.899631	[.368]
G33	-.386585	.930313E-02	-41.5543	[.000]
A3	-.194209	.102542	-1.89395	[.058]
B3	-.053111	.712820E-02	-7.45089	[.000]
D3	.013745	.892620E-02	1.53984	[.124]
G44	-.133430	.748302E-02	-17.8310	[.000]
A4	.832557E-02	.073436	.113371	[.910]
B4	-.017268	.502574E-02	-3.43591	[.001]
D4	.113974E-02	.640170E-02	.178038	[.859]
G55	-.245976	.025709	-9.56753	[.000]
A5	-.304550	.083313	-3.65548	[.000]
B5	-.014121	.234662E-02	-6.01774	[.000]
D5	-.768914E-02	.315141E-02	-2.43990	[.015]
G66	-.102531	.465155E-02	-22.0424	[.000]
A6	.053568	.049103	1.09093	[.275]
B6	-.749478E-02	.293547E-02	-2.55318	[.011]
D6	-.526235E-02	.391093E-02	-1.34555	[.178]
G77	-.138414	.528898E-02	-26.1703	[.000]
A7	-.082359	.043027	-1.91412	[.056]
B7	-.011655	.244152E-02	-4.77356	[.000]
D7	-.181248E-02	.327900E-02	-.552756	[.580]
G88	-.370450	.761480E-02	-48.6487	[.000]
A8	-.799940	.162515	-4.92227	[.000]
B8	-.014508	.010652	-1.36205	[.173]
D8	.011168	.014183	.787439	[.431]
G99	-.112751	.294170E-02	-38.3285	[.000]
A9	.050903	.026378	1.92978	[.054]
B9	-.888819E-02	.152053E-02	-5.84547	[.000]
D9	-.265431E-02	.204100E-02	-1.30050	[.193]
G1010	-.119914	.327446E-02	-36.6211	[.000]
A10	.860214E-02	.029937	.287338	[.774]
B10	-.752241E-02	.177499E-02	-4.23800	[.000]
D10	-.514941E-02	.238672E-02	-2.15752	[.031]
G1111	-.085841	.296933E-02	-28.9093	[.000]
A11	-.012765	.031426	-.406207	[.685]
B11	-.954875E-02	.208731E-02	-4.57466	[.000]
D11	-.732512E-03	.265959E-02	-.275423	[.783]
G1212	-.105271	.436010E-02	-24.1443	[.000]
A12	-.102141E-02	.049489	-.020639	[.984]
B12	-.013881	.297365E-02	-4.66799	[.000]
D12	.312191E-04	.393878E-02	.792607E-02	[.994]
G1313	-.065507	.346639E-02	-18.8977	[.000]
A13	-.996954E-02	.041052	-.242852	[.808]
B13	-.496441E-02	.269152E-02	-1.84447	[.065]

D13	.117585E-02	.342502E-02	.343313	[.731]
G1414	-.320746	.811775E-02	-39.5117	[.000]
A14	-.997442	.105493	-9.45504	[.000]
B14	.868800E-02	.702767E-02	1.23626	[.216]
D14	-.726058E-02	.921663E-02	-.787770	[.431]
G1515	-.083723	.329767E-02	-25.3886	[.000]
A15	-.057706	.040578	-1.42211	[.155]
B15	-.503095E-02	.266534E-02	-1.88755	[.059]
D15	-.106779E-02	.343465E-02	-.310886	[.756]
G1616	-.145388	.020028	-7.25934	[.000]
A16	-.165581	.064239	-2.57758	[.010]
B16	-.583786E-02	.162331E-02	-3.59626	[.000]
D16	.134437E-02	.216727E-02	.620305	[.535]
G1717	-.091211	.190168E-02	-47.9634	[.000]
A17	.060165	.026811	2.24401	[.025]
B17	-.911018E-02	.171233E-02	-5.32033	[.000]
D17	.242997E-02	.214011E-02	1.13544	[.256]
G1818	-.097083	.509986E-02	-19.0364	[.000]
A18	-.067664	.043380	-1.55980	[.119]
B18	-.204458E-02	.246920E-02	-.828035	[.408]
D18	-.441664E-02	.329618E-02	-1.33993	[.180]
G1919	-.152748	.023443	-6.51563	[.000]
A19	-.184033	.116155	-1.58436	[.113]
B19	-.490607E-02	.568450E-02	-.863062	[.388]
D19	-.021843	.759958E-02	-2.87426	[.004]
G2020	-.096120	.257615E-02	-37.3113	[.000]
A20	-.145926	.024230	-6.02251	[.000]
B20	-.308416E-02	.131737E-02	-2.34115	[.019]
D20	-.180584E-03	.171787E-02	-.105121	[.916]
G2121	-.048703	.194592E-02	-25.0284	[.000]
A21	.117490	.022864	5.13862	[.000]
B21	-.494045E-02	.132385E-02	-3.73187	[.000]
D21	-.172363E-02	.177197E-02	-.972720	[.331]
G2222	-.014956	.609624E-02	-2.45326	[.014]
A22	.073731	.062671	1.17647	[.239]
B22	-.262840E-02	.254744E-02	-1.03178	[.302]
D22	-.505218E-02	.344229E-02	-1.46768	[.142]
G2323	-.043312	.663269E-02	-6.53010	[.000]
A23	.261296	.047203	5.53564	[.000]
B23	.198817E-02	.295946E-02	.671801	[.502]
D23	.322823E-02	.389123E-02	.829618	[.407]
G2424	-.023752	.396599E-02	-5.98890	[.000]
A24	.152499	.042713	3.57035	[.000]
B24	-.322854E-02	.252660E-02	-1.27782	[.201]
D24	-.166241E-02	.337298E-02	-.492860	[.622]
G2525	-.068766	.175616E-02	-39.1569	[.000]
A25	.053917	.022034	2.44694	[.014]
B25	-.203381E-02	.127302E-02	-1.59762	[.110]
D25	-.150729E-02	.170097E-02	-.886137	[.376]
G2626	-.116444	.579700E-02	-20.0869	[.000]
A26	-.230863	.027438	-8.41387	[.000]
B26	-.255233E-02	.968124E-03	-2.63637	[.008]
D26	.108658E-02	.125773E-02	.863922	[.388]
G2727	-.049427	.207048E-02	-23.8722	[.000]
A27	-.045737	.023024	-1.98649	[.047]
B27	-.467428E-02	.142489E-02	-3.28046	[.001]
D27	-.209913E-02	.177751E-02	-1.18093	[.238]
G2828	-.034397	.325723E-02	-10.5602	[.000]
A28	.096846	.034458	2.81057	[.005]
B28	-.169369E-02	.206608E-02	-.819758	[.412]
D28	-.801646E-03	.276668E-02	-.289751	[.772]

G2929	-.040901	.250533E-02	-16.3256	[.000]
A29	.014942	.026343	.567205	[.571]
B29	-.278750E-02	.174067E-02	-1.60139	[.109]
D29	.157104E-02	.219783E-02	.714813	[.475]
G3030	-.054266	.230010E-02	-23.5929	[.000]
A30	.087986	.018682	4.70956	[.000]
B30	-.259601E-02	.100295E-02	-2.58837	[.010]
D30	.921452E-03	.132682E-02	.694482	[.487]
G3131	-.020364	.239858E-02	-8.49009	[.000]
A31	.015632	.014224	1.09904	[.272]
B31	-.208641E-02	.658536E-03	-3.16825	[.002]
D31	-.360527E-03	.814317E-03	-.442736	[.658]
G3232	-.039902	.159973E-02	-24.9430	[.000]
A32	.092211	.018640	4.94687	[.000]
B32	-.138034E-02	.102987E-02	-1.34030	[.180]
D32	-.144670E-02	.136634E-02	-1.05881	[.290]
G3333	-.066838	.336814E-02	-19.8442	[.000]
A33	-.018996	.022587	-.841050	[.400]
B33	-.229904E-02	.106625E-02	-2.15619	[.031]
D33	-.166709E-02	.140337E-02	-1.18792	[.235]
G3434	-.086892	.532449E-02	-16.3193	[.000]
A34	-.083295	.024715	-3.37025	[.001]
B34	-.369462E-02	.113687E-02	-3.24982	[.001]
D34	.234886E-02	.149793E-02	1.56807	[.117]
G3535	-.069062	.364628E-02	-18.9403	[.000]
A35	.548690E-02	.022576	.243046	[.808]
B35	-.251235E-02	.105060E-02	-2.39135	[.017]
D35	.455239E-05	.139052E-02	.327387E-02	[.997]
G3636	-.049495	.242695E-02	-20.3938	[.000]
A36	.035123	.026100	1.34573	[.178]
B36	-.870872E-03	.147025E-02	-.592328	[.554]
D36	-.134506E-02	.192933E-02	-.697165	[.486]
G3737	-.021361	.140541E-02	-15.1991	[.000]
A37	.126004	.022370	5.63260	[.000]
B37	-.239604E-02	.130236E-02	-1.83977	[.066]
D37	-.693157E-03	.171902E-02	-.403228	[.687]
G3838	.083822	.024664	3.39857	[.001]
A38	-.115604	.019537	-5.91729	[.000]
B38	-.143469E-02	.104708E-02	-1.37018	[.171]
D38	.107862E-02	.135474E-02	.796181	[.426]
G3939	-.092097	.443924E-02	-20.7460	[.000]
A39	-.084189	.020731	-4.06106	[.000]
B39	-.259398E-02	.929965E-03	-2.78933	[.005]
D39	.191249E-02	.120085E-02	1.59261	[.111]
G4040	-.120005	.432923E-02	-27.7196	[.000]
A40	-.289988	.024630	-11.7738	[.000]
B40	-.115063E-02	.929826E-03	-1.23747	[.216]
D40	-.315157E-03	.115302E-02	-.273331	[.785]
G4141	.107807	.024649	4.37374	[.000]
A41	-.039381	.018293	-2.15285	[.031]
B41	-.144287E-02	.909376E-03	-1.58666	[.113]
D41	.612743E-03	.113760E-02	.538626	[.590]
G4242	-.092750	.384197E-02	-24.1412	[.000]
A42	-.093951	.018797	-4.99805	[.000]
B42	-.174479E-02	.838503E-03	-2.08084	[.037]
D42	.209489E-02	.107210E-02	1.95400	[.051]
G4343	-.078142	.370822E-02	-21.0728	[.000]
A43	-.069853	.019519	-3.57878	[.000]
B43	-.150909E-02	.866008E-03	-1.74258	[.081]
D43	.234655E-02	.112699E-02	2.08213	[.037]
G4444	-.104205	.741152E-02	-14.0599	[.000]

A44	-.194870	.035106	-5.55083	[.000]
B44	.422369E-02	.137105E-02	3.08062	[.002]
D44	.134223E-02	.173943E-02	.771651	[.440]

SPECIFICATION #18

```
L0  = coefficient for   WF*WT*lnPj
L1  = coefficient for   WF*WT*SUJD*lnPj
L2  = coefficient for   WF*WT*(SUJD^2)*lnPj
L3  = coefficient for   WF*WT*(SUJD^3)*lnPj
L4  = coefficient for   WF*WT*(SUJD^4)*lnPj
L5  = coefficient for   WF*(1 – WT)*lnPj
L6  = coefficient for   WF*(1 – WT)*SUJD*lnPj
L7  = coefficient for   WF*(1 – WT)*(SUJD^2)*lnPj
L8  = coefficient for   WF*(1 – WT)*(SUJD^3)*lnPj
L9  = coefficient for   WF*(1 – WT)*(SUJD^4)*lnPj
L10 = coefficient for   (1 – WF)*WT*lnPj
L11 = coefficient for   (1 – WF)*WT*SUJD*lnPj
L12 = coefficient for   (1 – WF)*WT*(SUJD^2)*lnPj
L13 = coefficient for   (1 – WF)*WT*(SUJD^3)*lnPj
L14 = coefficient for   (1 – WF)*WT*(SUJD^4)*lnPj
L15 = coefficient for   (1 – WF)*(1 – WT)*lnPj
L16 = coefficient for   (1 – WF)*(1 – WT)*SUJD*lnPj
L17 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^2)*lnPj
L18 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^3)*lnPj
L19 = coefficient for   (1 – WF)*(1 – WT)*(SUJD^4)*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.229110E-02	.274170E-03	8.35651	[.000]
L1	-.810100E-02	.011881	-.681852	[.495]
L2	.558281	.121549	4.59305	[.000]
L3	-1.73838	.366821	-4.73905	[.000]
L4	1.22072	.277004	4.40687	[.000]
L5	.042567	.027165	1.56698	[.117]
L6	-14.5491	9.28515	-1.56692	[.117]
L7	1442.45	922.083	1.56433	[.118]
L8	-54012.6	34716.1	-1.55584	[.120]
L9	682860.	441849.	1.54546	[.122]
L10	.102800E-02	.138400E-03	7.42774	[.000]
L11	.020073	.686745E-02	2.92292	[.003]
L12	-.365586	.065572	-5.57531	[.000]
L13	1.23423	.182753	6.75356	[.000]
L14	-1.09920	.148739	-7.39015	[.000]
L15	.572368E-03	.171629E-02	.333491	[.739]
L16	-.066704	.597538	-.111631	[.911]
L17	10.5867	62.3489	.169798	[.865]
L18	-347.062	2526.02	-.137395	[.891]
L19	1210.88	34728.8	.034867	[.972]
G11	-.344260	.971765E-02	-35.4262	[.000]
A1	-.055096	.138856	-.396785	[.692]
B1	-.054844	.911152E-02	-6.01924	[.000]
D1	.014579	.012147	1.20019	[.230]
RHO	.830537	.011427	72.6820	[.000]
G22	-.276555	.818478E-02	-33.7890	[.000]

A2	-.010439	.068152	-.153169	[.878]
B2	-.034338	.419434E-02	-8.18682	[.000]
D2	-.497619E-02	.567464E-02	-.876917	[.381]
G33	-.389019	.933721E-02	-41.6633	[.000]
A3	-.192763	.102383	-1.88277	[.060]
B3	-.053986	.712769E-02	-7.57406	[.000]
D3	.013665	.893782E-02	1.52886	[.126]
G44	-.137533	.753344E-02	-18.2564	[.000]
A4	.018530	.072992	.253865	[.800]
B4	-.017816	.501315E-02	-3.55379	[.000]
D4	.917921E-03	.638512E-02	.143759	[.886]
G55	-.243011	.025033	-9.70756	[.000]
A5	-.293292	.081414	-3.60248	[.000]
B5	-.014011	.234740E-02	-5.96886	[.000]
D5	-.764120E-02	.316060E-02	-2.41764	[.016]
G66	-.105795	.443508E-02	-23.8541	[.000]
A6	.048144	.049234	.977847	[.328]
B6	-.728866E-02	.294610E-02	-2.47401	[.013]
D6	-.511758E-02	.393913E-02	-1.29916	[.194]
G77	-.139875	.534987E-02	-26.1456	[.000]
A7	-.087408	.042754	-2.04441	[.041]
B7	-.011284	.241570E-02	-4.67091	[.000]
D7	-.172570E-02	.324989E-02	-.531003	[.595]
G88	-.371112	.715148E-02	-51.8931	[.000]
A8	-.815954	.161965	-5.03783	[.000]
B8	-.014773	.010585	-1.39566	[.163]
D8	.010971	.014145	.775654	[.438]
G99	-.109561	.293291E-02	-37.3558	[.000]
A9	.060095	.026366	2.27925	[.023]
B9	-.892810E-02	.153218E-02	-5.82707	[.000]
D9	-.244836E-02	.205637E-02	-1.19063	[.234]
G1010	-.117060	.326051E-02	-35.9024	[.000]
A10	.018293	.029853	.612777	[.540]
B10	-.755283E-02	.177625E-02	-4.25213	[.000]
D10	-.496432E-02	.239232E-02	-2.07510	[.038]
G1111	-.087308	.298425E-02	-29.2562	[.000]
A11	-.460754E-02	.031537	-.146098	[.884]
B11	-.963780E-02	.209279E-02	-4.60524	[.000]
D11	-.740375E-03	.266976E-02	-.277319	[.782]
G1212	-.103608	.416782E-02	-24.8591	[.000]
A12	.020776	.049116	.423000	[.672]
B12	-.013082	.293911E-02	-4.45116	[.000]
D12	.633655E-03	.392130E-02	.161593	[.872]
G1313	-.065084	.332082E-02	-19.5989	[.000]
A13	-.012612	.040639	-.310355	[.756]
B13	-.468669E-02	.265741E-02	-1.76363	[.078]
D13	.823808E-03	.339488E-02	.242662	[.808]
G1414	-.315467	.835918E-02	-37.7389	[.000]
A14	-1.00407	.106039	-9.46891	[.000]
B14	.980697E-02	.707182E-02	1.38677	[.166]
D14	-.768156E-02	.928022E-02	-.827735	[.408]
G1515	-.086610	.328045E-02	-26.4020	[.000]
A15	-.057447	.040456	-1.41999	[.156]
B15	-.557332E-02	.266332E-02	-2.09262	[.036]
D15	-.110416E-02	.343611E-02	-.321339	[.748]
G1616	-.133845	.021429	-6.24593	[.000]
A16	-.129725	.068030	-1.90689	[.057]
B16	-.559118E-02	.161952E-02	-3.45237	[.001]
D16	.129218E-02	.216670E-02	.596382	[.551]
G1717	-.092566	.187415E-02	-49.3909	[.000]
A17	.052027	.026954	1.93023	[.054]

B17	-.956907E-02	.172267E-02	-5.55478	[.000]
D17	.227948E-02	.215389E-02	1.05831	[.290]
G1818	-.099115	.536908E-02	-18.4604	[.000]
A18	-.066131	.044017	-1.50241	[.133]
B18	-.198795E-02	.246676E-02	-.805897	[.420]
D18	-.429621E-02	.329667E-02	-1.30320	[.193]
G1919	-.160352	.021960	-7.30216	[.000]
A19	-.211386	.113127	-1.86857	[.062]
B19	-.585711E-02	.572552E-02	-1.02298	[.306]
D19	-.022293	.763576E-02	-2.91957	[.004]
G2020	-.095468	.275793E-02	-34.6158	[.000]
A20	-.144155	.024739	-5.82697	[.000]
B20	-.308854E-02	.130643E-02	-2.36410	[.018]
D20	-.300963E-03	.171079E-02	-.175921	[.860]
G2121	-.049975	.194601E-02	-25.6807	[.000]
A21	.119364	.023050	5.17840	[.000]
B21	-.499290E-02	.132462E-02	-3.76930	[.000]
D21	-.175421E-02	.177295E-02	-.989427	[.322]
G2222	-.014916	.587316E-02	-2.53972	[.011]
A22	.075799	.060986	1.24290	[.214]
B22	-.253289E-02	.254557E-02	-.995018	[.320]
D22	-.483193E-02	.341937E-02	-1.41311	[.158]
G2323	-.040472	.687445E-02	-5.88737	[.000]
A23	.256462	.047891	5.35512	[.000]
B23	.209279E-02	.297062E-02	.704497	[.481]
D23	.315572E-02	.392580E-02	.803841	[.421]
G2424	-.025959	.405657E-02	-6.39916	[.000]
A24	.148568	.043189	3.43992	[.001]
B24	-.291445E-02	.254616E-02	-1.14465	[.252]
D24	-.171388E-02	.340514E-02	-.503322	[.615]
G2525	-.067048	.174147E-02	-38.5008	[.000]
A25	.059968	.022236	2.69695	[.007]
B25	-.202177E-02	.129502E-02	-1.56119	[.118]
D25	-.134706E-02	.173239E-02	-.777570	[.437]
G2626	-.117322	.546138E-02	-21.4822	[.000]
A26	-.228209	.026631	-8.56936	[.000]
B26	-.241641E-02	.978350E-03	-2.46989	[.014]
D26	.130473E-02	.126974E-02	1.02756	[.304]
G2727	-.045544	.231346E-02	-19.6866	[.000]
A27	-.031517	.023157	-1.36099	[.174]
B27	-.450384E-02	.143712E-02	-3.13394	[.002]
D27	-.172188E-02	.178135E-02	-.966614	[.334]
G2828	-.034783	.331276E-02	-10.4996	[.000]
A28	.100345	.034382	2.91853	[.004]
B28	-.169670E-02	.205854E-02	-.824223	[.410]
D28	-.739102E-03	.275884E-02	-.267904	[.789]
G2929	-.041177	.243114E-02	-16.9374	[.000]
A29	.022997	.026822	.857373	[.391]
B29	-.279624E-02	.174000E-02	-1.60703	[.108]
D29	.163899E-02	.220975E-02	.741707	[.458]
G3030	-.052585	.200526E-02	-26.2236	[.000]
A30	.092212	.018346	5.02637	[.000]
B30	-.263291E-02	.983926E-03	-2.67592	[.007]
D30	.927186E-03	.129162E-02	.717845	[.473]
G3131	-.039871	.385217E-02	-10.3503	[.000]
A31	.014380	.017425	.825267	[.409]
B31	-.130030E-02	.828350E-03	-1.56975	[.116]
D31	-.678360E-03	.103634E-02	-.654575	[.513]
G3232	-.040585	.164372E-02	-24.6912	[.000]
A32	.095454	.018918	5.04578	[.000]
B32	-.135427E-02	.103265E-02	-1.31145	[.190]

D32	-.140777E-02	.137185E-02	-1.02619	[.305]
G3333	-.068378	.311798E-02	-21.9303	[.000]
A33	-.012767	.022376	-.570541	[.568]
B33	-.190697E-02	.107241E-02	-1.77821	[.075]
D33	-.145874E-02	.141104E-02	-1.03380	[.301]
G3434	-.095429	.592328E-02	-16.1109	[.000]
A34	-.076996	.025656	-3.00106	[.003]
B34	-.365688E-02	.113202E-02	-3.23039	[.001]
D34	.232307E-02	.149273E-02	1.55626	[.120]
G3535	-.074937	.283908E-02	-26.3947	[.000]
A35	-.011630	.021137	-.550237	[.582]
B35	-.253754E-02	.105333E-02	-2.40907	[.016]
D35	.213326E-03	.138588E-02	.153927	[.878]
G3636	-.050309	.235878E-02	-21.3284	[.000]
A36	.040150	.026421	1.51964	[.129]
B36	-.156098E-02	.149162E-02	-1.04650	[.295]
D36	-.148909E-02	.196395E-02	-.758213	[.448]
G3737	-.021746	.161404E-02	-13.4728	[.000]
A37	.119690	.022437	5.33459	[.000]
B37	-.255862E-02	.128874E-02	-1.98537	[.047]
D37	-.730430E-03	.170497E-02	-.428412	[.668]
G3838	-.070782	.017144	-4.12866	[.000]
A38	-.098661	.020786	-4.74645	[.000]
B38	-.915116E-03	.108516E-02	-.843300	[.399]
D38	.142105E-02	.141636E-02	1.00331	[.316]
G3939	-.099864	.470142E-02	-21.2413	[.000]
A39	-.079305	.020776	-3.81714	[.000]
B39	-.257658E-02	.914544E-03	-2.81734	[.005]
D39	.177254E-02	.117902E-02	1.50340	[.133]
G4040	-.118373	.459336E-02	-25.7704	[.000]
A40	-.286934	.025652	-11.1858	[.000]
B40	-.115454E-02	.935563E-03	-1.23406	[.217]
D40	-.821694E-04	.116584E-02	-.070481	[.944]
G4141	-.040771	.017118	-2.38179	[.017]
A41	-.231774E-02	.016558	-.139980	[.889]
B41	-.236318E-02	.817274E-03	-2.89154	[.004]
D41	.102677E-02	.101296E-02	1.01363	[.311]
G4242	-.090670	.393217E-02	-23.0585	[.000]
A42	-.087557	.018872	-4.63953	[.000]
B42	-.171750E-02	.828610E-03	-2.07275	[.038]
D42	.194650E-02	.105718E-02	1.84122	[.066]
G4343	-.076307	.375499E-02	-20.3214	[.000]
A43	-.064607	.019651	-3.28776	[.001]
B43	-.128590E-02	.858192E-03	-1.49838	[.134]
D43	.228919E-02	.111803E-02	2.04752	[.041]
G4444	-.097365	.671082E-02	-14.5086	[.000]
A44	-.173495	.032946	-5.26603	[.000]
B44	.340510E-02	.133007E-02	2.56009	[.010]
D44	.133430E-02	.169778E-02	.785907	[.432]

SPECIFICATION #19

L0 = coefficient for WF*lnPj
L1 = coefficient for WF*SU*lnPj
L2 = coefficient for (1 – WF)*lnPj
L3 = coefficient for (1 – WF)*SU*lnPj

Standard

Parameter	Estimate	Error	t-statistic	P-value
L0	.217571E-02	.165128E-03	13.1758	[.000]
L1	.223633E-02	.459568E-03	4.86615	[.000]
L2	.680060E-03	.818336E-04	8.31028	[.000]
L3	.735671E-03	.122050E-03	6.02763	[.000]
G11	-.346532	.991098E-02	-34.9645	[.000]
A1	-.114935	.136293	-.843295	[.399]
B1	-.055831	.896044E-02	-6.23079	[.000]
D1	.014483	.011892	1.21783	[.223]
RHO	.826576	.010716	77.1357	[.000]
G22	-.269477	.766189E-02	-35.1711	[.000]
A2	-.025463	.067858	-.375240	[.707]
B2	-.034867	.420240E-02	-8.29703	[.000]
D2	-.483530E-02	.566303E-02	-.853837	[.393]
G33	-.388107	.927294E-02	-41.8538	[.000]
A3	-.218540	.100432	-2.17600	[.030]
B3	-.054906	.702118E-02	-7.82001	[.000]
D3	.013432	.875518E-02	1.53417	[.125]
G44	-.141770	.712865E-02	-19.8874	[.000]
A4	.710470E-02	.071236	.099734	[.921]
B4	-.017235	.489994E-02	-3.51741	[.000]
D4	.441949E-03	.622466E-02	.071000	[.943]
G55	-.261382	.026280	-9.94598	[.000]
A5	-.380911	.084332	-4.51678	[.000]
B5	-.014227	.237106E-02	-6.00039	[.000]
D5	-.744627E-02	.318403E-02	-2.33863	[.019]
G66	-.106625	.448855E-02	-23.7550	[.000]
A6	.013231	.048772	.271280	[.786]
B6	-.788833E-02	.294122E-02	-2.68199	[.007]
D6	-.535425E-02	.391961E-02	-1.36602	[.172]
G77	-.139878	.629069E-02	-22.2358	[.000]
A7	-.107350	.043902	-2.44521	[.014]
B7	-.011538	.242767E-02	-4.75287	[.000]
D7	-.155416E-02	.326453E-02	-.476076	[.634]
G88	-.373132	.813167E-02	-45.8862	[.000]
A8	-.838804	.169074	-4.96116	[.000]
B8	-.015901	.011117	-1.43027	[.153]
D8	.011547	.014783	.781093	[.435]
G99	-.100463	.254573E-02	-39.4635	[.000]
A9	.041124	.025116	1.63734	[.102]
B9	-.952180E-02	.150010E-02	-6.34746	[.000]
D9	-.256333E-02	.200588E-02	-1.27791	[.201]
G1010	-.109185	.299200E-02	-36.4922	[.000]
A10	-.882084E-02	.028748	-.306834	[.759]
B10	-.809987E-02	.173469E-02	-4.66934	[.000]
D10	-.493582E-02	.232574E-02	-2.12225	[.034]
G1111	-.088029	.284411E-02	-30.9513	[.000]
A11	.653976E-02	.031177	.209761	[.834]
B11	-.929767E-02	.207365E-02	-4.48373	[.000]
D11	-.707081E-03	.264315E-02	-.267515	[.789]
G1212	-.104650	.377774E-02	-27.7018	[.000]
A12	-.042790	.049006	-.873159	[.383]
B12	-.011811	.298725E-02	-3.95376	[.000]
D12	.684907E-03	.400815E-02	.170879	[.864]
G1313	-.068385	.348675E-02	-19.6128	[.000]
A13	.025566	.039796	.642429	[.521]
B13	-.440600E-02	.270425E-02	-1.62929	[.103]
D13	.137010E-02	.341874E-02	.400762	[.689]
G1414	-.319848	.890351E-02	-35.9238	[.000]
A14	-1.01516	.105132	-9.65599	[.000]
B14	.619692E-02	.704241E-02	.879943	[.379]

D14	-.809487E-02	.919036E-02	-.880800	[.378]
G1515	-.089644	.319734E-02	-28.0369	[.000]
A15	-.027677	.039701	-.697131	[.486]
B15	-.540569E-02	.265146E-02	-2.03876	[.041]
D15	-.659338E-03	.340177E-02	-.193822	[.846]
G1616	-.135568	.020945	-6.47269	[.000]
A16	-.165246	.065831	-2.51014	[.012]
B16	-.586724E-02	.157711E-02	-3.72024	[.000]
D16	.138886E-02	.210780E-02	.658916	[.510]
G1717	-.091579	.183593E-02	-49.8813	[.000]
A17	.031223	.023112	1.35094	[.177]
B17	-.010932	.150097E-02	-7.28354	[.000]
D17	.244711E-02	.186220E-02	1.31409	[.189]
G1818	-.095713	.589130E-02	-16.2465	[.000]
A18	-.081481	.044360	-1.83681	[.066]
B18	-.289991E-02	.247008E-02	-1.17402	[.240]
D18	-.457808E-02	.328434E-02	-1.39391	[.163]
G1919	-.160511	.021606	-7.42890	[.000]
A19	-.248214	.112345	-2.20940	[.027]
B19	-.570529E-02	.567984E-02	-1.00448	[.315]
D19	-.021459	.763228E-02	-2.81159	[.005]
G2020	-.099240	.248164E-02	-39.9895	[.000]
A20	-.096629	.023082	-4.18642	[.000]
B20	-.394130E-02	.133610E-02	-2.94986	[.003]
D20	-.419993E-03	.176950E-02	-.237350	[.812]
G2121	-.048537	.223619E-02	-21.7053	[.000]
A21	.078868	.022119	3.56564	[.000]
B21	-.559973E-02	.132968E-02	-4.21132	[.000]
D21	-.184711E-02	.177560E-02	-1.04027	[.298]
G2222	-.011691	.641420E-02	-1.82262	[.068]
A22	.068339	.063230	1.08080	[.280]
B22	-.119044E-02	.249934E-02	-.476301	[.634]
D22	-.386577E-02	.339786E-02	-1.13771	[.255]
G2323	-.044707	.593505E-02	-7.53264	[.000]
A23	.247649	.042426	5.83725	[.000]
B23	-.237658E-02	.259418E-02	-.916118	[.360]
D23	.268685E-02	.346854E-02	.774633	[.439]
G2424	-.026389	.366887E-02	-7.19276	[.000]
A24	.101098	.040695	2.48427	[.013]
B24	-.285616E-02	.243095E-02	-1.17492	[.240]
D24	-.162340E-02	.324813E-02	-.499793	[.617]
G2525	-.059272	.151014E-02	-39.2491	[.000]
A25	.023221	.021771	1.06662	[.286]
B25	-.234133E-02	.132013E-02	-1.77356	[.076]
D25	-.121370E-02	.175903E-02	-.689983	[.490]
G2626	-.119746	.568671E-02	-21.0572	[.000]
A26	-.274370	.025946	-10.5745	[.000]
B26	-.258774E-02	.922039E-03	-2.80654	[.005]
D26	.115986E-02	.121289E-02	.956273	[.339]
G2727	-.054208	.192469E-02	-28.1645	[.000]
A27	.043303	.022584	1.91739	[.055]
B27	-.446029E-02	.146184E-02	-3.05114	[.002]
D27	-.120360E-02	.183871E-02	-.654592	[.513]
G2828	-.035364	.334572E-02	-10.5698	[.000]
A28	.065407	.034337	1.90483	[.057]
B28	-.218267E-02	.208808E-02	-1.04530	[.296]
D28	-.905897E-03	.279474E-02	-.324144	[.746]
G2929	-.042609	.233240E-02	-18.2682	[.000]
A29	.049174	.026544	1.85257	[.064]
B29	-.216253E-02	.175775E-02	-1.23028	[.219]
D29	.159433E-02	.222234E-02	.717414	[.473]

G3030	-.051436	.192884E-02	-26.6670	[.000]
A30	.066703	.017322	3.85075	[.000]
B30	-.331068E-02	.952099E-03	-3.47724	[.001]
D30	.607993E-03	.125114E-02	.485951	[.627]
G3131	-.030611	.220763E-02	-13.8658	[.000]
A31	.046671	.015414	3.02777	[.002]
B31	-.270721E-03	.765621E-03	-.353597	[.724]
D31	-.345422E-03	.997312E-03	-.346353	[.729]
G3232	-.040972	.170202E-02	-24.0727	[.000]
A32	.057310	.017830	3.21422	[.001]
B32	-.181578E-02	.102824E-02	-1.76591	[.077]
D32	-.149579E-02	.136222E-02	-1.09805	[.272]
G3333	-.068041	.321569E-02	-21.1590	[.000]
A33	-.021253	.022136	-.960126	[.337]
B33	-.207427E-02	.111702E-02	-1.85698	[.063]
D33	-.117831E-02	.148238E-02	-.794876	[.427]
G3434	-.094553	.557284E-02	-16.9668	[.000]
A34	-.100327	.024629	-4.07354	[.000]
B34	-.289540E-02	.112142E-02	-2.58190	[.010]
D34	.266742E-02	.148791E-02	1.79273	[.073]
G3535	-.075276	.295051E-02	-25.5130	[.000]
A35	-.049929	.020227	-2.46848	[.014]
B35	-.305678E-02	.100970E-02	-3.02742	[.002]
D35	.560280E-04	.133567E-02	.041948	[.967]
G3636	-.047707	.283993E-02	-16.7985	[.000]
A36	.605450E-02	.026102	.231955	[.817]
B36	-.277973E-03	.146381E-02	-.189898	[.849]
D36	-.135063E-02	.193346E-02	-.698555	[.485]
G3737	-.021683	.145156E-02	-14.9375	[.000]
A37	.101727	.022227	4.57663	[.000]
B37	-.216766E-02	.133079E-02	-1.62886	[.103]
D37	-.722021E-03	.176921E-02	-.408103	[.683]
G3838	-.078436	.241813E-02	-32.4365	[.000]
A38	-.087521	.019989	-4.37841	[.000]
B38	-.253179E-03	.113036E-02	-.223981	[.823]
D38	.134188E-02	.147887E-02	.907364	[.364]
G3939	-.084454	.412042E-02	-20.4965	[.000]
A39	-.108651	.019667	-5.52449	[.000]
B39	-.126923E-02	.904124E-03	-1.40383	[.160]
D39	.218994E-02	.118679E-02	1.84527	[.065]
G4040	-.120945	.481915E-02	-25.0967	[.000]
A40	-.300602	.022890	-13.1325	[.000]
B40	-.497508E-03	.850423E-03	-.585013	[.559]
D40	.315595E-03	.110886E-02	.284612	[.776]
G4141	-.052737	.213721E-02	-24.6755	[.000]
A41	-.999329E-02	.016141	-.619125	[.536]
B41	.721841E-04	.861457E-03	.083793	[.933]
D41	.131777E-02	.109984E-02	1.19814	[.231]
G4242	-.082945	.370282E-02	-22.4006	[.000]
A42	-.120978	.018039	-6.70641	[.000]
B42	-.351252E-03	.816218E-03	-.430340	[.667]
D42	.237027E-02	.106515E-02	2.22528	[.026]
G4343	-.077562	.396507E-02	-19.5613	[.000]
A43	-.091268	.018665	-4.88971	[.000]
B43	-.110712E-02	.831696E-03	-1.33116	[.183]
D43	.246398E-02	.108937E-02	2.26184	[.024]
G4444	-.098832	.738398E-02	-13.3847	[.000]
A44	-.201843	.033746	-5.98118	[.000]
B44	.250089E-02	.125037E-02	2.00012	[.045]
D44	.122317E-02	.161770E-02	.756118	[.450]

SPECIFICATION #20

```
L0  = coefficient for   WF*lnPj
L1  = coefficient for   WF*J*lnPj
L2  = coefficient for   (1 – WF)*lnPj
L3  = coefficient for   (1 – WF)*J*lnPj
```

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.135600E-04	.160495E-03	.084489	[.933]
L1	.758133E-02	.384219E-03	19.7318	[.000]
L2	.848110E-03	.731972E-04	11.5866	[.000]
L3	.208874E-03	.176179E-03	1.18557	[.236]
G11	-.341270	.985668E-02	-34.6232	[.000]
A1	-.074654	.132712	-.562528	[.574]
B1	-.050599	.873215E-02	-5.79458	[.000]
D1	.014638	.011575	1.26463	[.206]
RHO	.826238	.011341	72.8517	[.000]
G22	-.275237	.735772E-02	-37.4079	[.000]
A2	-.026639	.067770	-.393079	[.694]
B2	-.034489	.420296E-02	-8.20587	[.000]
D2	-.455710E-02	.566213E-02	-.804839	[.421]
G33	-.383510	.898280E-02	-42.6938	[.000]
A3	-.182400	.101105	-1.80407	[.071]
B3	-.049579	.702396E-02	-7.05859	[.000]
D3	.013844	.880984E-02	1.57139	[.116]
G44	-.147703	.713172E-02	-20.7107	[.000]
A4	.032757	.071507	.458089	[.647]
B4	-.017957	.492407E-02	-3.64683	[.000]
D4	.533669E-03	.625953E-02	.085257	[.932]
G55	-.287123	.027215	-10.5503	[.000]
A5	-.415364	.086627	-4.79488	[.000]
B5	-.013586	.234728E-02	-5.78809	[.000]
D5	-.751600E-02	.315076E-02	-2.38546	[.017]
G66	-.098399	.449603E-02	-21.8858	[.000]
A6	.027861	.047427	.587452	[.557]
B6	-.774766E-02	.286014E-02	-2.70884	[.007]
D6	-.523605E-02	.380801E-02	-1.37501	[.169]
G77	-.144605	.618471E-02	-23.3810	[.000]
A7	-.125661	.046145	-2.72319	[.006]
B7	-.010931	.259936E-02	-4.20533	[.000]
D7	-.158004E-02	.349428E-02	-.452179	[.651]
G88	-.364154	.857355E-02	-42.4741	[.000]
A8	-.802321	.167366	-4.79381	[.000]
B8	-.947137E-02	.011028	-.858867	[.390]
D8	.011984	.014629	.819215	[.413]
G99	-.119475	.287067E-02	-41.6191	[.000]
A9	.020736	.024784	.836661	[.403]
B9	-.915578E-02	.147560E-02	-6.20480	[.000]
D9	-.260948E-02	.197640E-02	-1.32032	[.187]
G1010	-.126440	.321069E-02	-39.3811	[.000]
A10	-.023195	.029096	-.797197	[.425]
B10	-.759871E-02	.176199E-02	-4.31256	[.000]
D10	-.500489E-02	.236527E-02	-2.11599	[.034]
G1111	-.089087	.251789E-02	-35.3817	[.000]
A11	.011605	.030747	.377452	[.706]
B11	-.987540E-02	.204692E-02	-4.82452	[.000]

D11	-.903125E-03	.262992E-02	-.343404	[.731]
G1212	-.102137	.430765E-02	-23.7107	[.000]
A12	.382142E-03	.049147	.777552E-02	[.994]
B12	-.012368	.294916E-02	-4.19359	[.000]
D12	.106679E-02	.395800E-02	.269528	[.788]
G1313	-.066478	.334270E-02	-19.8877	[.000]
A13	.018507	.039408	.469640	[.639]
B13	-.419864E-02	.268375E-02	-1.56447	[.118]
D13	.141028E-02	.340272E-02	.414456	[.679]
G1414	-.322126	.825493E-02	-39.0222	[.000]
A14	-.977246	.103521	-9.44004	[.000]
B14	.010566	.691633E-02	1.52766	[.127]
D14	-.722343E-02	.904204E-02	-.798872	[.424]
G1515	-.091783	.292976E-02	-31.3280	[.000]
A15	-.109522E-02	.039697	-.027589	[.978]
B15	-.539283E-02	.264618E-02	-2.03797	[.042]
D15	-.201730E-03	.342277E-02	-.058938	[.953]
G1616	-.169288	.017782	-9.52002	[.000]
A16	-.223485	.057508	-3.88612	[.000]
B16	-.517921E-02	.159638E-02	-3.24435	[.001]
D16	.126984E-02	.213248E-02	.595477	[.552]
G1717	-.089370	.165073E-02	-54.1396	[.000]
A17	.074837	.025140	2.97681	[.003]
B17	-.623027E-02	.162594E-02	-3.83180	[.000]
D17	.256997E-02	.203971E-02	1.25997	[.208]
G1818	-.092218	.515099E-02	-17.9031	[.000]
A18	-.106113	.041391	-2.56363	[.010]
B18	-.239932E-02	.236348E-02	-1.01516	[.310]
D18	-.451172E-02	.314699E-02	-1.43366	[.152]
G1919	-.147665	.019708	-7.49279	[.000]
A19	-.181189	.107979	-1.67800	[.093]
B19	-.515661E-03	.565315E-02	-.091217	[.927]
D19	-.021024	.758091E-02	-2.77334	[.006]
G2020	-.094779	.284468E-02	-33.3181	[.000]
A20	-.100889	.022389	-4.50616	[.000]
B20	-.338408E-02	.128035E-02	-2.64309	[.008]
D20	-.238868E-03	.169156E-02	-.141212	[.888]
G2121	-.050704	.189796E-02	-26.7151	[.000]
A21	.092922	.021502	4.32155	[.000]
B21	-.523541E-02	.132636E-02	-3.94719	[.000]
D21	-.154957E-02	.177172E-02	-.874613	[.382]
G2222	-.012652	.670702E-02	-1.88643	[.059]
A22	.077474	.064990	1.19210	[.233]
B22	-.153716E-02	.251049E-02	-.612296	[.540]
D22	-.402994E-02	.341851E-02	-1.17886	[.238]
G2323	-.044184	.649187E-02	-6.80611	[.000]
A23	.284181	.044878	6.33236	[.000]
B23	.287128E-02	.276637E-02	1.03792	[.299]
D23	.299054E-02	.367551E-02	.813641	[.416]
G2424	-.023389	.396183E-02	-5.90355	[.000]
A24	.141308	.041078	3.43997	[.001]
B24	-.242616E-02	.243464E-02	-.996519	[.319]
D24	-.150396E-02	.324909E-02	-.462887	[.643]
G2525	-.073683	.163829E-02	-44.9753	[.000]
A25	.030080	.019249	1.56268	[.118]
B25	-.229197E-02	.115836E-02	-1.97863	[.048]
D25	-.142158E-02	.154264E-02	-.921524	[.357]
G2626	-.114991	.611318E-02	-18.8103	[.000]
A26	-.251343	.026870	-9.35410	[.000]
B26	-.255009E-02	.923059E-03	-2.76265	[.006]
D26	.111932E-02	.122123E-02	.916556	[.359]

G2727	-.057174	.188012E-02	-30.4097	[.000]
A27	.040293	.021832	1.84562	[.065]
B27	-.474172E-02	.143554E-02	-3.30310	[.001]
D27	-.113213E-02	.180718E-02	-.626465	[.531]
G2828	-.034117	.347833E-02	-9.80838	[.000]
A28	.059194	.034219	1.72985	[.084]
B28	-.185967E-02	.209004E-02	-.889778	[.374]
D28	-.803392E-03	.279889E-02	-.287039	[.774]
G2929	-.043975	.236049E-02	-18.6296	[.000]
A29	.043933	.026340	1.66791	[.095]
B29	-.194091E-02	.175853E-02	-1.10371	[.270]
D29	.176215E-02	.223271E-02	.789246	[.430]
G3030	-.068671	.339906E-02	-20.2031	[.000]
A30	.055128	.022628	2.43623	[.015]
B30	-.317783E-02	.132219E-02	-2.40345	[.016]
D30	.149188E-02	.176031E-02	.847510	[.397]
G3131	-.029091	.240773E-02	-12.0825	[.000]
A31	.043281	.015040	2.87762	[.004]
B31	-.707386E-03	.752617E-03	-.939902	[.347]
D31	-.292831E-03	.971248E-03	-.301500	[.763]
G3232	-.035759	.145895E-02	-24.5103	[.000]
A32	.048803	.017156	2.84474	[.004]
B32	-.155518E-02	.102062E-02	-1.52376	[.128]
D32	-.131403E-02	.135421E-02	-.970329	[.332]
G3333	-.074541	.376010E-02	-19.8243	[.000]
A33	-.085953	.024225	-3.54809	[.000]
B33	-.161466E-02	.121971E-02	-1.32381	[.186]
D33	-.162371E-02	.162157E-02	-1.00132	[.317]
G3434	-.093574	.517594E-02	-18.0786	[.000]
A34	-.119292	.023823	-5.00736	[.000]
B34	-.321469E-02	.109639E-02	-2.93206	[.003]
D34	.230636E-02	.145043E-02	1.59012	[.112]
G3535	-.078961	.342733E-02	-23.0388	[.000]
A35	-.091037	.020789	-4.37912	[.000]
B35	-.274426E-02	.102747E-02	-2.67089	[.008]
D35	-.167070E-03	.136657E-02	-.122255	[.903]
G3636	-.046111	.266244E-02	-17.3190	[.000]
A36	.035550	.026435	1.34483	[.179]
B36	.797861E-04	.151039E-02	.052825	[.958]
D36	-.115417E-02	.199638E-02	-.578130	[.563]
G3737	-.018717	.163017E-02	-11.4816	[.000]
A37	.140466	.022673	6.19532	[.000]
B37	-.193405E-02	.135383E-02	-1.42858	[.153]
D37	-.637091E-03	.179664E-02	-.354601	[.723]
G3838	-.080256	.288725E-02	-27.7967	[.000]
A38	-.079776	.021065	-3.78705	[.000]
B38	.104077E-02	.118911E-02	.875255	[.381]
D38	.157023E-02	.156776E-02	1.00158	[.317]
G3939	-.093105	.402970E-02	-23.1046	[.000]
A39	-.102993	.019503	-5.28094	[.000]
B39	-.230016E-02	.880093E-03	-2.61354	[.009]
D39	.192358E-02	.114993E-02	1.67279	[.094]
G4040	-.118696	.476594E-02	-24.9050	[.000]
A40	-.295613	.022291	-13.2614	[.000]
B40	-.944507E-03	.822488E-03	-1.14835	[.251]
D40	.782234E-04	.107743E-02	.072602	[.942]
G4141	-.055681	.255158E-02	-21.8223	[.000]
A41	-.571872E-02	.017674	-.323559	[.746]
B41	.135778E-02	.959627E-03	1.41491	[.157]
D41	.147352E-02	.124678E-02	1.18186	[.237]
G4242	-.091206	.335075E-02	-27.2194	[.000]

A42	-.111679	.017335	-6.44240	[.000]
B42	-.144179E-02	.782527E-03	-1.84248	[.065]
D42	.207817E-02	.101494E-02	2.04758	[.041]
G4343	-.079323	.381760E-02	-20.7781	[.000]
A43	-.062390	.018659	-3.34377	[.001]
B43	-.951318E-03	.837507E-03	-1.13589	[.256]
D43	.234793E-02	.109314E-02	2.14787	[.032]
G4444	-.106296	.728858E-02	-14.5839	[.000]
A44	-.207265	.035836	-5.78363	[.000]
B44	.896154E-02	.153343E-02	5.84413	[.000]
D44	.147823E-02	.195317E-02	.756837	[.449]

SPECIFICATION #21

L0 = coefficient for lnPj
L1 = coefficient for SU*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.748954E-03	.813616E-04	9.20526	[.000]
L1	.145588E-02	.133708E-03	10.8885	[.000]
G11	-.346803	.010241	-33.8630	[.000]
A1	-.100432	.138294	-.726219	[.468]
B1	-.057491	.909057E-02	-6.32429	[.000]
D1	.014371	.012077	1.18994	[.234]
RHO	.827779	.010837	76.3834	[.000]
G22	-.269519	.742268E-02	-36.3102	[.000]
A2	-.020033	.067991	-.294635	[.768]
B2	-.034587	.420896E-02	-8.21745	[.000]
D2	-.474073E-02	.567712E-02	-.835059	[.404]
G33	-.389304	.948966E-02	-41.0240	[.000]
A3	-.207402	.100384	-2.06609	[.039]
B3	-.056577	.704414E-02	-8.03175	[.000]
D3	.013578	.876222E-02	1.54960	[.121]
G44	-.139350	.671099E-02	-20.7645	[.000]
A4	.535248E-03	.070385	.760457E-02	[.994]
B4	-.016383	.481725E-02	-3.40101	[.001]
D4	.568321E-03	.615663E-02	.092310	[.926]
G55	-.253814	.024706	-10.2734	[.000]
A5	-.360760	.080252	-4.49536	[.000]
B5	-.014009	.236852E-02	-5.91473	[.000]
D5	-.748299E-02	.318374E-02	-2.35038	[.019]
G66	-.104239	.453126E-02	-23.0044	[.000]
A6	.013872	.048579	.285564	[.775]
B6	-.753325E-02	.291025E-02	-2.58853	[.010]
D6	-.526822E-02	.388201E-02	-1.35709	[.175]
G77	-.143061	.579571E-02	-24.6840	[.000]
A7	-.107200	.043856	-2.44433	[.015]
B7	-.011220	.247774E-02	-4.52834	[.000]
D7	-.147948E-02	.333401E-02	-.443754	[.657]
G88	-.369316	.722968E-02	-51.0834	[.000]
A8	-.829371	.169487	-4.89342	[.000]
B8	-.016469	.011116	-1.48160	[.138]
D8	.011681	.014833	.787508	[.431]
G99	-.093249	.238270E-02	-39.1357	[.000]
A9	.039951	.024481	1.63196	[.103]
B9	-.921719E-02	.147332E-02	-6.25608	[.000]

D9	-.228562E-02	.197136E-02	-1.15941	[.246]
G1010	-.102774	.275853E-02	-37.2568	[.000]
A10	-.713581E-02	.028280	-.252325	[.801]
B10	-.778385E-02	.171556E-02	-4.53719	[.000]
D10	-.470507E-02	.230133E-02	-2.04450	[.041]
G1111	-.091807	.270575E-02	-33.9303	[.000]
A11	.018033	.030833	.584875	[.559]
B11	-.905395E-02	.204484E-02	-4.42771	[.000]
D11	-.377125E-03	.261273E-02	-.144341	[.885]
G1212	-.105704	.378246E-02	-27.9459	[.000]
A12	-.053367	.049279	-1.08295	[.279]
B12	-.011599	.301856E-02	-3.84244	[.000]
D12	.523213E-03	.405384E-02	.129066	[.897]
G1313	-.069845	.326155E-02	-21.4148	[.000]
A13	.011079	.039542	.280190	[.779]
B13	-.372193E-02	.267303E-02	-1.39240	[.164]
D13	.156642E-02	.339844E-02	.460921	[.645]
G1414	-.320188	.921415E-02	-34.7497	[.000]
A14	-1.00683	.105854	-9.51151	[.000]
B14	.477420E-02	.710186E-02	.672247	[.501]
D14	-.819140E-02	.926346E-02	-.884270	[.377]
G1515	-.089562	.288771E-02	-31.0148	[.000]
A15	-.034392	.039143	-.878617	[.380]
B15	-.503299E-02	.260545E-02	-1.93172	[.053]
D15	-.705705E-03	.336285E-02	-.209853	[.834]
G1616	-.129508	.019920	-6.50155	[.000]
A16	-.149154	.063268	-2.35748	[.018]
B16	-.567599E-02	.159545E-02	-3.55761	[.000]
D16	.136099E-02	.213498E-02	.637473	[.524]
G1717	-.093302	.161053E-02	-57.9326	[.000]
A17	.040508	.022915	1.76776	[.077]
B17	-.012683	.147461E-02	-8.60125	[.000]
D17	.243456E-02	.185896E-02	1.30964	[.190]
G1818	-.093380	.548951E-02	-17.0106	[.000]
A18	-.081278	.042868	-1.89601	[.058]
B18	-.245820E-02	.239909E-02	-1.02464	[.306]
D18	-.451322E-02	.319571E-02	-1.41228	[.158]
G1919	-.161327	.021060	-7.66041	[.000]
A19	-.235533	.111632	-2.10991	[.035]
B19	-.751662E-02	.568948E-02	-1.32114	[.186]
D19	-.021515	.765867E-02	-2.80925	[.005]
G2020	-.100744	.232315E-02	-43.3652	[.000]
A20	-.108095	.022286	-4.85041	[.000]
B20	-.345904E-02	.128538E-02	-2.69106	[.007]
D20	-.259920E-03	.169861E-02	-.153019	[.878]
G2121	-.048902	.207886E-02	-23.5237	[.000]
A21	.079679	.022524	3.53746	[.000]
B21	-.526245E-02	.134635E-02	-3.90867	[.000]
D21	-.171783E-02	.179944E-02	-.954643	[.340]
G2222	-.014121	.600880E-02	-2.35001	[.019]
A22	.048681	.061161	.795953	[.426]
B22	-.123952E-02	.252370E-02	-.491152	[.623]
D22	-.408552E-02	.342846E-02	-1.19165	[.233]
G2323	-.046429	.586081E-02	-7.92188	[.000]
A23	.256935	.042304	6.07361	[.000]
B23	-.418460E-02	.255922E-02	-1.63511	[.102]
D23	.263399E-02	.343553E-02	.766692	[.443]
G2424	-.027016	.328647E-02	-8.22031	[.000]
A24	.081580	.037723	2.16264	[.031]
B24	-.227376E-02	.225642E-02	-1.00769	[.314]
D24	-.155114E-02	.301743E-02	-.514061	[.607]

G2525	-.052403	.158979E-02	-32.9619	[.000]
A25	.023103	.022414	1.03075	[.303]
B25	-.185808E-02	.137012E-02	-1.35615	[.175]
D25	-.801267E-03	.183010E-02	-.437826	[.662]
G2626	-.119609	.586220E-02	-20.4035	[.000]
A26	-.252282	.026634	-9.47214	[.000]
B26	-.268486E-02	.937483E-03	-2.86391	[.004]
D26	.121173E-02	.123533E-02	.980893	[.327]
G2727	-.054583	.172767E-02	-31.5931	[.000]
A27	.053458	.022775	2.34719	[.019]
B27	-.428304E-02	.145341E-02	-2.94689	[.003]
D27	-.994952E-03	.185284E-02	-.536989	[.591]
G2828	-.034303	.345662E-02	-9.92381	[.000]
A28	.059387	.034967	1.69835	[.089]
B28	-.154797E-02	.212525E-02	-.728370	[.466]
D28	-.770761E-03	.284855E-02	-.270580	[.787]
G2929	-.041570	.222015E-02	-18.7239	[.000]
A29	.058491	.026470	2.20973	[.027]
B29	-.165370E-02	.173988E-02	-.950470	[.342]
D29	.197620E-02	.221527E-02	.892083	[.372]
G3030	-.043899	.134112E-02	-32.7335	[.000]
A30	.064351	.014644	4.39442	[.000]
B30	-.287467E-02	.780431E-03	-3.68344	[.000]
D30	.508736E-03	.101575E-02	.500850	[.616]
G3131	-.036936	.308306E-02	-11.9803	[.000]
A31	.026268	.018164	1.44618	[.148]
B31	.100651E-02	.885780E-03	1.13630	[.256]
D31	-.368818E-03	.117295E-02	-.314435	[.753]
G3232	-.037284	.155312E-02	-24.0057	[.000]
A32	.047882	.017677	2.70879	[.007]
B32	-.152640E-02	.101919E-02	-1.49766	[.134]
D32	-.130391E-02	.135047E-02	-.965523	[.334]
G3333	-.073107	.295322E-02	-24.7550	[.000]
A33	-.056897	.021283	-2.67330	[.008]
B33	-.186264E-02	.109431E-02	-1.70211	[.089]
D33	-.138925E-02	.145261E-02	-.956384	[.339]
G3434	-.090500	.530807E-02	-17.0496	[.000]
A34	-.094705	.024355	-3.88857	[.000]
B34	-.268663E-02	.111798E-02	-2.40312	[.016]
D34	.237513E-02	.148225E-02	1.60238	[.109]
G3535	-.078899	.298690E-02	-26.4149	[.000]
A35	-.080345	.019962	-4.02491	[.000]
B35	-.288442E-02	.988501E-03	-2.91797	[.004]
D35	-.149205E-03	.130836E-02	-.114040	[.909]
G3636	-.045062	.260110E-02	-17.3243	[.000]
A36	.215526E-02	.024398	.088338	[.930]
B36	.259316E-03	.136164E-02	.190443	[.849]
D36	-.138177E-02	.179702E-02	-.768922	[.442]
G3737	-.020299	.148252E-02	-13.6923	[.000]
A37	.087222	.022523	3.87266	[.000]
B37	-.137445E-02	.134856E-02	-1.01920	[.308]
D37	-.597028E-03	.179537E-02	-.332537	[.739]
G3838	-.078372	.235545E-02	-33.2726	[.000]
A38	-.085740	.019721	-4.34756	[.000]
B38	-.432596E-03	.109938E-02	-.393490	[.694]
D38	.142669E-02	.144833E-02	.985054	[.325]
G3939	-.084582	.398279E-02	-21.2369	[.000]
A39	-.094138	.019579	-4.80806	[.000]
B39	-.157677E-02	.894037E-03	-1.76366	[.078]
D39	.205040E-02	.117409E-02	1.74637	[.081]
G4040	-.123038	.420505E-02	-29.2595	[.000]

A40	-.294717	.021562	-13.6687	[.000]
B40	-.103048E-02	.854961E-03	-1.20530	[.228]
D40	.124212E-03	.111823E-02	.111079	[.912]
G4141	-.053740	.196318E-02	-27.3739	[.000]
A41	-.011429	.015393	-.742484	[.458]
B41	-.119961E-03	.804032E-03	-.149199	[.881]
D41	.133261E-02	.103364E-02	1.28925	[.197]
G4242	-.083574	.337659E-02	-24.7512	[.000]
A42	-.110419	.017565	-6.28615	[.000]
B42	-.593759E-03	.803710E-03	-.738773	[.460]
D42	.228557E-02	.104855E-02	2.17974	[.029]
G4343	-.080075	.398007E-02	-20.1191	[.000]
A43	-.093969	.019262	-4.87850	[.000]
B43	-.511010E-03	.864022E-03	-.591432	[.554]
D43	.252419E-02	.113178E-02	2.23028	[.026]
G4444	-.096796	.697076E-02	-13.8860	[.000]
A44	-.179397	.032621	-5.49951	[.000]
B44	.841361E-03	.124677E-02	.674834	[.500]
D44	.131398E-02	.162886E-02	.806688	[.420]

SPECIFICATION #22

L0 = coefficient for lnPj
L1 = coefficient for J*lnPj

Parameter	Estimate	Standard Error	t-statistic	P-value
L0	.730848E-03	.959291E-04	7.61863	[.000]
L1	.181005E-02	.188051E-03	9.62534	[.000]
G11	-.347220	.010091	-34.4076	[.000]
A1	-.057596	.137907	-.417643	[.676]
B1	-.056670	.905553E-02	-6.25811	[.000]
D1	.013920	.011987	1.16120	[.246]
RHO	.823637	.011308	72.8363	[.000]
G22	-.266565	.733635E-02	-36.3348	[.000]
A2	-.016090	.068145	-.236111	[.813]
B2	-.034716	.421398E-02	-8.23839	[.000]
D2	-.461675E-02	.565934E-02	-.815776	[.415]
G33	-.387658	.944972E-02	-41.0232	[.000]
A3	-.165584	.100906	-1.64097	[.101]
B3	-.055231	.705998E-02	-7.82314	[.000]
D3	.013053	.876024E-02	1.49004	[.136]
G44	-.148450	.694266E-02	-21.3823	[.000]
A4	.482734E-02	.070908	.068078	[.946]
B4	-.018099	.487301E-02	-3.71406	[.000]
D4	.491095E-03	.617331E-02	.079551	[.937]
G55	-.248063	.025728	-9.64163	[.000]
A5	-.289385	.083294	-3.47426	[.001]
B5	-.012242	.236654E-02	-5.17307	[.000]
D5	-.786731E-02	.316116E-02	-2.48874	[.013]
G66	-.105828	.450541E-02	-23.4892	[.000]
A6	-.012088	.048300	-.250259	[.802]
B6	-.764729E-02	.288940E-02	-2.64668	[.008]
D6	-.536033E-02	.383461E-02	-1.39788	[.162]
G77	-.143369	.699322E-02	-20.5012	[.000]
A7	-.069073	.047161	-1.46464	[.143]
B7	-.951609E-02	.252596E-02	-3.76731	[.000]

D7	-.177242E-02	.338305E-02	-.523913	[.600]
G88	-.370773	.804788E-02	-46.0709	[.000]
A8	-.784316	.168186	-4.66338	[.000]
B8	-.015745	.011050	-1.42483	[.154]
D8	.011187	.014655	.763358	[.445]
G99	-.099613	.243606E-02	-40.8911	[.000]
A9	.017453	.024634	.708481	[.479]
B9	-.932989E-02	.145725E-02	-6.40238	[.000]
D9	-.236514E-02	.193542E-02	-1.22203	[.222]
G1010	-.107301	.276877E-02	-38.7540	[.000]
A10	-.027256	.028386	-.960180	[.337]
B10	-.785359E-02	.169734E-02	-4.62699	[.000]
D10	-.474491E-02	.226227E-02	-2.09742	[.036]
G1111	-.097526	.256784E-02	-37.9799	[.000]
A11	.021040	.031358	.670972	[.502]
B11	-.999806E-02	.205603E-02	-4.86281	[.000]
D11	-.384407E-03	.262071E-02	-.146681	[.883]
G1212	-.102747	.465746E-02	-22.0607	[.000]
A12	-.034806	.050484	-.689449	[.491]
B12	-.012353	.299860E-02	-4.11958	[.000]
D12	.577833E-03	.400920E-02	.144127	[.885]
G1313	-.074199	.346125E-02	-21.4372	[.000]
A13	.017094	.040296	.424212	[.671]
B13	-.455417E-02	.273960E-02	-1.66235	[.096]
D13	.146790E-02	.343769E-02	.427002	[.669]
G1414	-.319785	.916314E-02	-34.8991	[.000]
A14	-.955777	.104954	-9.10661	[.000]
B14	.605908E-02	.703127E-02	.861734	[.389]
D14	-.842725E-02	.913054E-02	-.922974	[.356]
G1515	-.094375	.286355E-02	-32.9572	[.000]
A15	-.029542	.039462	-.748605	[.454]
B15	-.588854E-02	.261598E-02	-2.25099	[.024]
D15	-.479636E-03	.335836E-02	-.142819	[.886]
G1616	-.128035	.018885	-6.77967	[.000]
A16	-.090259	.061616	-1.46486	[.143]
B16	-.387411E-02	.167601E-02	-2.31151	[.021]
D16	.105138E-02	.222402E-02	.472737	[.636]
G1717	-.092354	.154079E-02	-59.9395	[.000]
A17	.089850	.024734	3.63266	[.000]
B17	-.011516	.152636E-02	-7.54494	[.000]
D17	.203509E-02	.192748E-02	1.05583	[.291]
G1818	-.095461	.524353E-02	-18.2055	[.000]
A18	-.108917	.042596	-2.55698	[.011]
B18	-.254496E-02	.240238E-02	-1.05935	[.289]
D18	-.440753E-02	.318533E-02	-1.38369	[.166]
G1919	-.152773	.022525	-6.78249	[.000]
A19	-.163054	.114610	-1.42269	[.155]
B19	-.646263E-02	.570701E-02	-1.13240	[.257]
D19	-.021650	.764946E-02	-2.83023	[.005]
G2020	-.102233	.250445E-02	-40.8205	[.000]
A20	-.112690	.023394	-4.81701	[.000]
B20	-.302246E-02	.132760E-02	-2.27664	[.023]
D20	-.308572E-04	.173523E-02	-.017783	[.986]
G2121	-.047087	.202802E-02	-23.2181	[.000]
A21	.090125	.022481	4.00899	[.000]
B21	-.554749E-02	.133194E-02	-4.16497	[.000]
D21	-.173663E-02	.176423E-02	-.984358	[.325]
G2222	-.012886	.642548E-02	-2.00547	[.045]
A22	.062869	.063524	.989702	[.322]
B22	-.142353E-02	.256693E-02	-.554563	[.579]
D22	-.397688E-02	.347420E-02	-1.14469	[.252]

G2323	-.044917	.602875E-02	-7.45050	[.000]
A23	.296464	.043594	6.80064	[.000]
B23	-.307149E-02	.263300E-02	-1.16654	[.243]
D23	.233655E-02	.351454E-02	.664822	[.506]
G2424	-.024645	.347204E-02	-7.09824	[.000]
A24	.147577	.039979	3.69134	[.000]
B24	-.703112E-03	.236825E-02	-.296891	[.767]
D24	-.192196E-02	.314704E-02	-.610719	[.541]
G2525	-.058274	.156873E-02	-37.1472	[.000]
A25	.832212E-02	.021742	.382770	[.702]
B25	-.210893E-02	.129001E-02	-1.63481	[.102]
D25	-.105045E-02	.170587E-02	-.615785	[.538]
G2626	-.119624	.697274E-02	-17.1560	[.000]
A26	-.251534	.030041	-8.37310	[.000]
B26	-.263242E-02	.936520E-03	-2.81085	[.005]
D26	.130632E-02	.122019E-02	1.07058	[.284]
G2727	-.057680	.176073E-02	-32.7588	[.000]
A27	.057928	.023486	2.46645	[.014]
B27	-.476479E-02	.148547E-02	-3.20760	[.001]
D27	-.105405E-02	.187282E-02	-.562812	[.574]
G2828	-.034604	.362768E-02	-9.53882	[.000]
A28	.041462	.034848	1.18978	[.234]
B28	-.183202E-02	.209087E-02	-.876199	[.381]
D28	-.802079E-03	.278601E-02	-.287895	[.773]
G2929	-.044869	.228093E-02	-19.6714	[.000]
A29	.062606	.027530	2.27412	[.023]
B29	-.213722E-02	.179927E-02	-1.18783	[.235]
D29	.185725E-02	.227063E-02	.817948	[.413]
G3030	-.050347	.179557E-02	-28.0395	[.000]
A30	.043100	.015902	2.71045	[.007]
B30	-.307949E-02	.814444E-03	-3.78109	[.000]
D30	.716299E-03	.104402E-02	.686098	[.493]
G3131	-.039759	.364049E-02	-10.9213	[.000]
A31	.017387	.020925	.830924	[.406]
B31	.145214E-02	.100273E-02	1.44819	[.148]
D31	-.418496E-03	.131763E-02	-.317612	[.751]
G3232	-.035544	.158665E-02	-22.4017	[.000]
A32	.054827	.018166	3.01810	[.003]
B32	-.187022E-02	.102740E-02	-1.82035	[.069]
D32	-.135090E-02	.134524E-02	-1.00421	[.315]
G3333	-.072908	.374963E-02	-19.4439	[.000]
A33	-.017047	.024495	-.695946	[.486]
B33	-.165676E-03	.116125E-02	-.142671	[.887]
D33	-.174268E-02	.152279E-02	-1.14440	[.252]
G3434	-.095591	.537183E-02	-17.7949	[.000]
A34	-.065033	.025464	-2.55387	[.011]
B34	-.166488E-02	.113278E-02	-1.46972	[.142]
D34	.220521E-02	.147973E-02	1.49028	[.136]
G3535	-.076904	.324255E-02	-23.7171	[.000]
A35	-.072023	.020851	-3.45418	[.001]
B35	-.297324E-02	.986851E-03	-3.01286	[.003]
D35	.214615E-04	.129117E-02	.016622	[.987]
G3636	-.045665	.264229E-02	-17.2822	[.000]
A36	.048924	.026455	1.84929	[.064]
B36	.162705E-02	.145861E-02	1.11548	[.265]
D36	-.161132E-02	.190799E-02	-.844509	[.398]
G3737	-.020167	.188896E-02	-10.6762	[.000]
A37	.141605	.024257	5.83780	[.000]
B37	.947201E-04	.139251E-02	.068021	[.946]
D37	-.935964E-03	.183312E-02	-.510586	[.610]
G3838	-.080764	.257910E-02	-31.3149	[.000]

A38	-.092806	.021149	-4.38812	[.000]
B38	-.184778E-04	.115610E-02	-.015983	[.987]
D38	.148923E-02	.150493E-02	.989569	[.322]
G3939	-.088191	.376629E-02	-23.4158	[.000]
A39	-.060172	.020623	-2.91775	[.004]
B39	-.531800E-03	.928729E-03	-.572610	[.567]
D39	.184087E-02	.119606E-02	1.53911	[.124]
G4040	-.122258	.523573E-02	-23.3507	[.000]
A40	-.291136	.024586	-11.8416	[.000]
B40	-.971125E-03	.861608E-03	-1.12711	[.260]
D40	.222840E-03	.111126E-02	.200529	[.841]
G4141	-.056212	.214797E-02	-26.1697	[.000]
A41	-.018806	.017210	-1.09276	[.274]
B41	.297360E-03	.891456E-03	.333566	[.739]
D41	.137729E-02	.113021E-02	1.21862	[.223]
G4242	-.086665	.317126E-02	-27.3284	[.000]
A42	-.069891	.019047	-3.66945	[.000]
B42	.317740E-03	.858186E-03	.370246	[.711]
D42	.198384E-02	.109721E-02	1.80809	[.071]
G4343	-.081241	.373695E-02	-21.7399	[.000]
A43	-.054371	.020519	-2.64982	[.008]
B43	.392308E-03	.916485E-03	.428057	[.669]
D43	.222194E-02	.117884E-02	1.88485	[.059]
G4444	-.100021	.659458E-02	-15.1671	[.000]
A44	-.147790	.032597	-4.53380	[.000]
B44	.264683E-02	.127867E-02	2.06998	[.038]
D44	.829903E-03	.165403E-02	.501747	[.616]

APPENDIX B

SECTION 2 UNCOMPENSATED DEMAND ELASTICITY ESTIMATES FOR SPECIFICATION 3

Note: E*ij* = elasticity of product *i* with respect to product *j*.

Parameter	Estimate	Standard Error	t-statistic	P-value
E11	-4.31380	.089055	-48.4400	[.000]
E1E2	.056252	.788217E-02	7.13659	[.000]
E1E3	.070442	.749644E-02	9.39669	[.000]
E1E4	.034264	.431381E-02	7.94295	[.000]
E1E5	.028617	.346060E-02	8.26948	[.000]
E1E6	.029680	.358456E-02	8.28007	[.000]
E1E7	.024206	.282623E-02	8.56487	[.000]
E1E8	.072484	.617754E-02	11.7334	[.000]
E1E9	.024132	.270069E-02	8.93553	[.000]
E1E10	.023985	.267763E-02	8.95745	[.000]
E1E11	.022955	.251399E-02	9.13073	[.000]
E1E12	.022609	.246080E-02	9.18776	[.000]
E1E13	.021259	.225065E-02	9.44554	[.000]
E1E14	.037491	.241972E-02	15.4941	[.000]
E1E15	.020678	.216123E-02	9.56772	[.000]
E1E16	.019873	.209453E-02	9.48791	[.000]
E1E17	.037773	.231949E-02	16.2850	[.000]
E1E18	.018821	.188196E-02	10.0006	[.000]
E1E19	.066799	.571338E-02	11.6916	[.000]
E1E20	.017486	.168113E-02	10.4015	[.000]
E1E21	.017454	.167980E-02	10.3905	[.000]
E1E22	.015599	.141154E-02	11.0511	[.000]
E1E23	.034487	.197322E-02	17.4777	[.000]
E1E24	.014364	.134362E-02	10.6906	[.000]
E1E25	.014782	.130074E-02	11.3645	[.000]
E1E26	.014869	.131158E-02	11.3368	[.000]
E1E27	.014709	.128948E-02	11.4065	[.000]
E1E28	.014465	.126019E-02	11.4784	[.000]
E1E29	.014302	.123577E-02	11.5731	[.000]
E1E30	.014150	.121732E-02	11.6243	[.000]
E1E31	.013911	.118526E-02	11.7366	[.000]
E1E32	.013768	.116852E-02	11.7820	[.000]
E1E33	.012666	.115695E-02	10.9479	[.000]
E1E34	.011884	.118533E-02	10.0259	[.000]
E1E35	.013163	.109452E-02	12.0263	[.000]
E1E36	.012389	.107844E-02	11.4875	[.000]
E1E37	.010871	.118916E-02	9.14178	[.000]
E1E38	.012910	.106265E-02	12.1490	[.000]
E1E39	.011363	.110133E-02	10.3173	[.000]
E1E40	.012678	.103610E-02	12.2364	[.000]
E1E41	.012567	.102330E-02	12.2812	[.000]
E1E42	.010538	.103971E-02	10.1355	[.000]
E1E43	.011235	.951302E-03	11.8102	[.000]
E1E44	.033142	.186373E-02	17.7826	[.000]
E2E1	.049011	.487030E-02	10.0633	[.000]

E22	-3.97949	.084907	-46.8687	[.000]
E2E3	.041791	.400715E-02	10.4292	[.000]
E2E4	.027889	.239525E-02	11.6436	[.000]
E2E5	.024290	.197410E-02	12.3042	[.000]
E2E6	.023001	.208175E-02	11.0488	[.000]
E2E7	.035270	.230488E-02	15.3025	[.000]
E2E8	.019879	.150702E-02	13.1910	[.000]
E2E9	.020080	.159080E-02	12.6225	[.000]
E2E10	.020041	.157885E-02	12.6937	[.000]
E2E11	.019793	.150755E-02	13.1293	[.000]
E2E12	.019367	.147756E-02	13.1076	[.000]
E2E13	.018549	.138515E-02	13.3911	[.000]
E2E14	.017727	.129848E-02	13.6520	[.000]
E2E15	.018222	.134878E-02	13.5098	[.000]
E2E16	.018050	.132861E-02	13.5857	[.000]
E2E17	.016837	.121830E-02	13.8200	[.000]
E2E18	.015766	.124200E-02	12.6940	[.000]
E2E19	.017065	.123839E-02	13.7799	[.000]
E2E20	.015839	.113822E-02	13.9158	[.000]
E2E21	.033135	.187934E-02	17.6310	[.000]
E2E22	.014327	.102584E-02	13.9664	[.000]
E2E23	.014492	.103198E-02	14.0427	[.000]
E2E24	.014379	.102422E-02	14.0393	[.000]
E2E25	.013333	.984623E-03	13.5410	[.000]
E2E26	.013873	.991476E-03	13.9920	[.000]
E2E27	.013846	.988032E-03	14.0139	[.000]
E2E28	.011275	.124297E-02	9.07131	[.000]
E2E29	.013563	.969700E-03	13.9865	[.000]
E2E30	.013123	.952313E-03	13.7802	[.000]
E2E31	.013274	.952040E-03	13.9428	[.000]
E2E32	.013069	.940976E-03	13.8885	[.000]
E2E33	.013312	.956986E-03	13.9106	[.000]
E2E34	.013159	.948558E-03	13.8731	[.000]
E2E35	.011967	.924717E-03	12.9416	[.000]
E2E36	.012930	.936142E-03	13.8121	[.000]
E2E37	.012743	.926733E-03	13.7506	[.000]
E2E38	.012555	.912348E-03	13.7610	[.000]
E2E39	.012715	.925412E-03	13.7402	[.000]
E2E40	.012224	.896067E-03	13.6413	[.000]
E2E41	.012309	.900323E-03	13.6714	[.000]
E2E42	.012200	.901853E-03	13.5275	[.000]
E2E43	.012133	.899230E-03	13.4932	[.000]
E2E44	.012105	.897689E-03	13.4843	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E3E1	.096433	.882520E-02	10.9270	[.000]
E3E2	.067052	.759925E-02	8.82345	[.000]
E33	-5.56164	.109888	-50.6120	[.000]
E3E4	.040957	.419174E-02	9.77095	[.000]
E3E5	.034458	.338195E-02	10.1888	[.000]
E3E6	.035516	.349890E-02	10.1505	[.000]
E3E7	.028798	.278539E-02	10.3390	[.000]
E3E8	.048302	.293320E-02	16.4674	[.000]
E3E9	.028932	.266510E-02	10.8557	[.000]
E3E10	.028757	.264348E-02	10.8786	[.000]
E3E11	.027537	.249048E-02	11.0567	[.000]
E3E12	.027124	.244056E-02	11.1137	[.000]
E3E13	.025521	.224475E-02	11.3692	[.000]
E3E14	.067640	.484347E-02	13.9652	[.000]
E3E15	.024837	.216194E-02	11.4884	[.000]
E3E16	.023519	.209668E-02	11.2172	[.000]

E3E17	.062321	.424821E-02	14.6699	[.000]
E3E18	.022625	.190330E-02	11.8874	[.000]
E3E19	.043943	.249744E-02	17.5951	[.000]
E3E20	.021044	.172040E-02	12.2321	[.000]
E3E21	.021004	.171836E-02	12.2232	[.000]
E3E22	.018804	.147747E-02	12.7271	[.000]
E3E23	.055922	.373297E-02	14.9806	[.000]
E3E24	.017253	.141446E-02	12.1977	[.000]
E3E25	.017833	.137892E-02	12.9328	[.000]
E3E26	.017940	.138904E-02	12.9156	[.000]
E3E27	.017747	.136958E-02	12.9577	[.000]
E3E28	.017455	.134251E-02	13.0016	[.000]
E3E29	.017266	.132261E-02	13.0543	[.000]
E3E30	.017087	.130601E-02	13.0832	[.000]
E3E31	.016800	.127852E-02	13.1401	[.000]
E3E32	.016631	.126336E-02	13.1638	[.000]
E3E33	.015716	.123330E-02	12.7426	[.000]
E3E34	.015814	.120894E-02	13.0812	[.000]
E3E35	.015913	.119926E-02	13.2694	[.000]
E3E36	.013884	.128744E-02	10.7845	[.000]
E3E37	.015013	.114642E-02	13.0953	[.000]
E3E38	.015612	.117316E-02	13.3077	[.000]
E3E39	.015091	.114423E-02	13.1891	[.000]
E3E40	.015337	.115044E-02	13.3315	[.000]
E3E41	.015205	.113982E-02	13.3402	[.000]
E3E42	.014234	.107481E-02	13.2430	[.000]
E3E43	.014240	.107001E-02	13.3080	[.000]
E3E44	.041737	.237078E-02	17.6048	[.000]
E4E1	.053972	.010561	5.11049	[.000]
E4E2	.048816	.920918E-02	5.30076	[.000]
E4E3	.047298	.867564E-02	5.45186	[.000]
E44	-3.80037	.154419	-24.6107	[.000]
E4E5	.031124	.420036E-02	7.40995	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E4E6	.031208	.431201E-02	7.23742	[.000]
E4E7	.028461	.350645E-02	8.11680	[.000]
E4E8	.027045	.314921E-02	8.58795	[.000]
E4E9	.027323	.333409E-02	8.19499	[.000]
E4E10	.027123	.330515E-02	8.20643	[.000]
E4E11	.026026	.311726E-02	8.34903	[.000]
E4E12	.025709	.305910E-02	8.40415	[.000]
E4E13	.922723E-02	.648175E-02	1.42357	[.155]
E4E14	.025055	.267045E-02	9.38244	[.000]
E4E15	.054503	.391472E-02	13.9226	[.000]
E4E16	.025360	.274065E-02	9.25322	[.000]
E4E17	.024234	.248377E-02	9.75685	[.000]
E4E18	.023800	.247935E-02	9.59914	[.000]
E4E19	.024444	.253059E-02	9.65950	[.000]
E4E20	.016225	.318135E-02	5.10011	[.000]
E4E21	.022932	.228266E-02	10.0463	[.000]
E4E22	.021157	.201006E-02	10.5256	[.000]
E4E23	.022066	.204041E-02	10.8144	[.000]
E4E24	.021960	.202117E-02	10.8649	[.000]
E4E25	.021022	.192548E-02	10.9177	[.000]
E4E26	.021085	.193501E-02	10.8964	[.000]
E4E27	.010367	.424641E-02	2.44132	[.015]
E4E28	.021143	.191083E-02	11.0650	[.000]
E4E29	.019617	.186066E-02	10.5429	[.000]
E4E30	.020773	.186339E-02	11.1478	[.000]
E4E31	.012758	.324346E-02	3.93355	[.000]

E4E32	.020279	.181000E-02	11.2038	[.000]
E4E33	.020979	.185670E-02	11.2993	[.000]
E4E34	.020834	.183485E-02	11.3548	[.000]
E4E35	.020304	.177627E-02	11.4305	[.000]
E4E36	.020622	.180421E-02	11.4299	[.000]
E4E37	.020449	.178018E-02	11.4870	[.000]
E4E38	.141871	.014745	9.62155	[.000]
E4E39	.020424	.177676E-02	11.4950	[.000]
E4E40	.054161	.324384E-02	16.6964	[.000]
E4E41	.143335	.015011	9.54883	[.000]
E4E42	.019948	.171703E-02	11.6176	[.000]
E4E43	.019887	.170998E-02	11.6298	[.000]
E4E44	.019862	.170723E-02	11.6342	[.000]
E5E1	.057684	.642561E-02	8.97723	[.000]
E5E2	.053795	.567024E-02	9.48722	[.000]
E5E3	.051433	.534821E-02	9.61683	[.000]
E5E4	.039163	.343089E-02	11.4147	[.000]
E55	-7.51998	.709384	-10.6007	[.000]
E5E6	.036024	.301488E-02	11.9486	[.000]
E5E7	.032278	.259511E-02	12.4380	[.000]
E5E8	.030626	.242896E-02	12.6088	[.000]
E5E9	.032353	.256856E-02	12.5958	[.000]
E5E10	.032253	.255765E-02	12.6105	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E5E11	.031595	.248596E-02	12.7095	[.000]
E5E12	.031360	.246177E-02	12.7389	[.000]
E5E13	.030470	.237309E-02	12.8397	[.000]
E5E14	.029024	.224975E-02	12.9011	[.000]
E5E15	.030069	.233552E-02	12.8747	[.000]
E5E16	.065724	.419787E-02	15.6565	[.000]
E5E17	.028133	.217573E-02	12.9304	[.000]
E5E18	.028799	.222534E-02	12.9415	[.000]
E5E19	.028031	.217878E-02	12.8655	[.000]
E5E20	.027948	.216147E-02	12.9300	[.000]
E5E21	.027879	.215501E-02	12.9366	[.000]
E5E22	.026673	.207952E-02	12.8265	[.000]
E5E23	.025956	.202596E-02	12.8117	[.000]
E5E24	.025831	.201899E-02	12.7942	[.000]
E5E25	.026108	.204839E-02	12.7457	[.000]
E5E26	.026176	.205265E-02	12.7525	[.000]
E5E27	.026094	.205007E-02	12.7281	[.000]
E5E28	.025859	.203379E-02	12.7148	[.000]
E5E29	.025815	.203660E-02	12.6755	[.000]
E5E30	.025674	.202746E-02	12.6634	[.000]
E5E31	.056366	.426373E-02	13.2199	[.000]
E5E32	.025425	.201712E-02	12.6047	[.000]
E5E33	.024596	.195836E-02	12.5594	[.000]
E5E34	.024102	.194102E-02	12.4172	[.000]
E5E35	.024986	.199777E-02	12.5069	[.000]
E5E36	.024503	.195914E-02	12.5069	[.000]
E5E37	.023972	.193434E-02	12.3926	[.000]
E5E38	.024892	.200132E-02	12.4377	[.000]
E5E39	.023665	.192530E-02	12.2917	[.000]
E5E40	.024720	.199442E-02	12.3947	[.000]
E5E41	.024663	.199428E-02	12.3667	[.000]
E5E42	.023147	.191001E-02	12.1189	[.000]
E5E43	.072040	.414568E-02	17.3771	[.000]
E5E44	.023609	.192794E-02	12.2459	[.000]
E6E1	.040777	.760681E-02	5.36063	[.000]
E6E2	.034166	.676264E-02	5.05215	[.000]

E6E3	.037149	.629340E-02	5.90284	[.000]
E6E4	.029882	.388379E-02	7.69392	[.000]
E6E5	.028374	.328792E-02	8.62966	[.000]
E66	-3.60847	.115125	-31.3438	[.000]
E6E7	.026905	.285890E-02	9.41083	[.000]
E6E8	.026138	.264829E-02	9.86962	[.000]
E6E9	.025385	.273774E-02	9.27213	[.000]
E6E10	.025267	.272309E-02	9.27864	[.000]
E6E11	.025823	.263875E-02	9.78609	[.000]
E6E12	.025426	.259511E-02	9.79783	[.000]
E6E13	.025185	.247883E-02	10.1602	[.000]
E6E14	.025056	.238018E-02	10.5268	[.000]
E6E15	.025131	.243562E-02	10.3181	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E6E16	.025221	.241825E-02	10.4296	[.000]
E6E17	.024607	.228125E-02	10.7868	[.000]
E6E18	.072620	.428930E-02	16.9304	[.000]
E6E19	.024723	.230578E-02	10.7223	[.000]
E6E20	.023820	.217219E-02	10.9659	[.000]
E6E21	.023328	.215208E-02	10.8397	[.000]
E6E22	.022879	.203661E-02	11.2340	[.000]
E6E23	.023429	.206415E-02	11.3505	[.000]
E6E24	.054460	.410452E-02	13.2682	[.000]
E6E25	.021996	.197819E-02	11.1192	[.000]
E6E26	.022687	.199906E-02	11.3486	[.000]
E6E27	.022829	.200183E-02	11.4041	[.000]
E6E28	.086612	.554764E-02	15.6124	[.000]
E6E29	.022675	.198115E-02	11.4454	[.000]
E6E30	.021946	.194763E-02	11.2679	[.000]
E6E31	.022544	.196358E-02	11.4810	[.000]
E6E32	.022104	.193775E-02	11.4072	[.000]
E6E33	.022837	.198370E-02	11.5122	[.000]
E6E34	.022764	.197519E-02	11.5249	[.000]
E6E35	.020762	.191867E-02	10.8212	[.000]
E6E36	.053750	.405750E-02	13.2471	[.000]
E6E37	.053620	.405457E-02	13.2245	[.000]
E6E38	.022181	.192281E-02	11.5357	[.000]
E6E39	.022541	.195182E-02	11.5487	[.000]
E6E40	.021824	.189895E-02	11.4929	[.000]
E6E41	.022057	.191090E-02	11.5428	[.000]
E6E42	.022282	.192886E-02	11.5517	[.000]
E6E43	.022253	.192669E-02	11.5497	[.000]
E6E44	.022229	.192464E-02	11.5497	[.000]
E7E1	.061639	.831579E-02	7.41224	[.000]
E7E2	.098934	.863514E-02	11.4571	[.000]
E7E3	.054327	.691935E-02	7.85146	[.000]
E7E4	.044492	.440487E-02	10.1007	[.000]
E7E5	.040098	.373654E-02	10.7313	[.000]
E7E6	.041280	.385519E-02	10.7075	[.000]
E77	-5.46867	.202973	-26.9428	[.000]
E7E8	.034523	.307492E-02	11.2274	[.000]
E7E9	.037598	.326203E-02	11.5259	[.000]
E7E10	.037500	.324767E-02	11.5466	[.000]
E7E11	.036858	.315224E-02	11.6925	[.000]
E7E12	.036603	.311857E-02	11.7372	[.000]
E7E13	.035710	.299921E-02	11.9066	[.000]
E7E14	.032194	.281881E-02	11.4212	[.000]
E7E15	.035329	.295081E-02	11.9725	[.000]
E7E16	.031252	.294485E-02	10.6124	[.000]
E7E17	.030486	.277908E-02	10.9699	[.000]

E7E18	.033993	.279799E-02	12.1492	[.000]
E7E19	.031800	.273779E-02	11.6153	[.000]
E7E20	.033163	.271151E-02	12.2305	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E7E21	.072504	.531375E-02	13.6446	[.000]
E7E22	.031869	.259847E-02	12.2647	[.000]
E7E23	.028641	.254498E-02	11.2541	[.000]
E7E24	.029647	.248928E-02	11.9099	[.000]
E7E25	.031285	.255473E-02	12.2459	[.000]
E7E26	.031379	.256248E-02	12.2455	[.000]
E7E27	.031288	.255700E-02	12.2362	[.000]
E7E28	.031004	.253348E-02	12.2377	[.000]
E7E29	.031014	.253914E-02	12.2142	[.000]
E7E30	.030860	.252715E-02	12.2115	[.000]
E7E31	.030749	.252319E-02	12.1867	[.000]
E7E32	.030597	.251133E-02	12.1838	[.000]
E7E33	.023583	.314009E-02	7.51026	[.000]
E7E34	.028820	.241324E-02	11.9424	[.000]
E7E35	.030142	.248446E-02	12.1321	[.000]
E7E36	.027460	.243145E-02	11.2938	[.000]
E7E37	.028236	.239240E-02	11.8026	[.000]
E7E38	.030074	.248797E-02	12.0876	[.000]
E7E39	.028439	.239205E-02	11.8890	[.000]
E7E40	.029897	.247861E-02	12.0619	[.000]
E7E41	.029842	.247782E-02	12.0437	[.000]
E7E42	.027881	.237053E-02	11.7616	[.000]
E7E43	.028229	.237617E-02	11.8801	[.000]
E7E44	.020534	.361214E-02	5.68465	[.000]
E8E1	.275258	.046188	5.95956	[.000]
E8E2	.080804	.035817	2.25604	[.024]
E8E3	.142248	.033952	4.18963	[.000]
E8E4	.057978	.019536	2.96775	[.003]
E8E5	.051201	.015639	3.27386	[.001]
E8E6	.053082	.016200	3.27662	[.001]
E8E7	.045711	.012724	3.59235	[.000]
E88	-14.7052	.289416	-50.8101	[.000]
E8E9	.047366	.012141	3.90134	[.000]
E8E10	.047210	.012035	3.92280	[.000]
E8E11	.046184	.011279	4.09456	[.000]
E8E12	.045811	.011034	4.15173	[.000]
E8E13	.044418	.010062	4.41435	[.000]
E8E14	.110256	.010359	10.6433	[.000]
E8E15	.043816	.964788E-02	4.54149	[.000]
E8E16	.041927	.935376E-02	4.48233	[.000]
E8E17	.114264	.979167E-02	11.6695	[.000]
E8E18	.041811	.835065E-02	5.00691	[.000]
E8E19	.430580	.054304	7.92908	[.000]
E8E20	.040485	.740908E-02	5.46423	[.000]
E8E21	.040359	.740500E-02	5.45020	[.000]
E8E22	.038502	.613540E-02	6.27532	[.000]
E8E23	.111306	.806972E-02	13.7930	[.000]
E8E24	.034497	.584596E-02	5.90100	[.000]
E8E25	.037618	.560672E-02	6.70953	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E8E26	.037739	.565777E-02	6.67033	[.000]
E8E27	.037590	.555088E-02	6.77193	[.000]
E8E28	.037224	.541387E-02	6.87571	[.000]
E8E29	.037163	.529212E-02	7.02237	[.000]
E8E30	.036958	.520473E-02	7.10079	[.000]

E8E31	.036759	.504722E-02	7.28301	[.000]
E8E32	.036543	.496815E-02	7.35554	[.000]
E8E33	.033306	.488406E-02	6.81936	[.000]
E8E34	.030045	.500023E-02	6.00864	[.000]
E8E35	.035882	.460789E-02	7.78700	[.000]
E8E36	.032877	.455571E-02	7.21655	[.000]
E8E37	.023538	.585226E-02	4.02198	[.000]
E8E38	.035715	.444644E-02	8.03231	[.000]
E8E39	.029819	.459641E-02	6.48744	[.000]
E8E40	.035456	.431571E-02	8.21568	[.000]
E8E41	.035358	.425119E-02	8.31720	[.000]
E8E42	.029027	.421741E-02	6.88272	[.000]
E8E43	.031846	.391367E-02	8.13720	[.000]
E8E44	.110764	.694251E-02	15.9545	[.000]
E9E1	.060239	.547143E-02	11.0098	[.000]
E9E2	.053828	.486487E-02	11.0646	[.000]
E9E3	.054408	.465798E-02	11.6806	[.000]
E9E4	.042435	.325689E-02	13.0293	[.000]
E9E5	.040282	.301306E-02	13.3690	[.000]
E9E6	.038962	.298133E-02	13.0688	[.000]
E9E7	.037943	.282727E-02	13.4203	[.000]
E9E8	.036711	.274536E-02	13.3720	[.000]
E99	-4.53429	.087685	-51.7110	[.000]
E9E10	.129318	.827286E-02	15.6316	[.000]
E9E11	.035951	.269101E-02	13.3596	[.000]
E9E12	.034416	.266079E-02	12.9345	[.000]
E9E13	.034885	.262801E-02	13.2742	[.000]
E9E14	.034973	.265079E-02	13.1934	[.000]
E9E15	.034944	.263256E-02	13.2736	[.000]
E9E16	.035232	.266316E-02	13.2296	[.000]
E9E17	.034253	.261936E-02	13.0769	[.000]
E9E18	.030970	.261554E-02	11.8409	[.000]
E9E19	.034438	.262707E-02	13.1089	[.000]
E9E20	.032686	.252697E-02	12.9348	[.000]
E9E21	.032773	.253148E-02	12.9463	[.000]
E9E22	.030094	.248400E-02	12.1151	[.000]
E9E23	.032359	.256037E-02	12.6386	[.000]
E9E24	.032270	.255870E-02	12.6120	[.000]
E9E25	.133182	.939728E-02	14.1724	[.000]
E9E26	.030267	.246232E-02	12.2920	[.000]
E9E27	.031107	.248433E-02	12.5212	[.000]
E9E28	.030088	.245801E-02	12.2409	[.000]
E9E29	.030857	.247933E-02	12.4457	[.000]
E9E30	.107213	.635628E-02	16.8673	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E9E31	.030652	.247695E-02	12.3748	[.000]
E9E32	.081491	.516053E-02	15.7911	[.000]
E9E33	.072447	.546390E-02	13.2591	[.000]
E9E34	.031285	.254313E-02	12.3019	[.000]
E9E35	.092267	.533326E-02	17.3003	[.000]
E9E36	.031098	.254083E-02	12.2394	[.000]
E9E37	.030949	.253989E-02	12.1850	[.000]
E9E38	.030066	.247005E-02	12.1723	[.000]
E9E39	.030927	.253988E-02	12.1764	[.000]
E9E40	.028178	.246484E-02	11.4318	[.000]
E9E41	.029867	.246858E-02	12.0989	[.000]
E9E42	.030510	.253767E-02	12.0228	[.000]
E9E43	.030458	.253795E-02	12.0012	[.000]
E9E44	.030430	.253676E-02	11.9955	[.000]
E10E1	.055667	.629637E-02	8.84118	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E10E2	.050064	.556812E-02	8.99110	[.000]
E10E3	.050718	.531305E-02	9.54588	[.000]
E10E4	.040238	.358002E-02	11.2397	[.000]
E10E5	.038722	.324805E-02	11.9216	[.000]
E10E6	.037234	.323283E-02	11.5176	[.000]
E10E7	.036735	.299915E-02	12.2486	[.000]
E10E8	.035686	.288556E-02	12.3672	[.000]
E10E9	.129120	.839676E-02	15.3773	[.000]
E1010	-4.79482	.103436	-46.3552	[.000]
E10E11	.034675	.282486E-02	12.2749	[.000]
E10E12	.033298	.280217E-02	11.8828	[.000]
E10E13	.033817	.274092E-02	12.3378	[.000]
E10E14	.034212	.275138E-02	12.4345	[.000]
E10E15	.033982	.273656E-02	12.4178	[.000]
E10E16	.034436	.276976E-02	12.4330	[.000]
E10E17	.033601	.270536E-02	12.4200	[.000]
E10E18	.030721	.266818E-02	11.5138	[.000]
E10E19	.033756	.271650E-02	12.4263	[.000]
E10E20	.031930	.259306E-02	12.3138	[.000]
E10E21	.032008	.259617E-02	12.3290	[.000]
E10E22	.029515	.254701E-02	11.5882	[.000]
E10E23	.031992	.261420E-02	12.2379	[.000]
E10E24	.031915	.261106E-02	12.2231	[.000]
E10E25	.116785	.735251E-02	15.8837	[.000]
E10E26	.029540	.251743E-02	11.7341	[.000]
E10E27	.030636	.252581E-02	12.1292	[.000]
E10E28	.029979	.250643E-02	11.9610	[.000]
E10E29	.030327	.251397E-02	12.0634	[.000]
E10E30	.111221	.677686E-02	16.4119	[.000]
E10E31	.030258	.251274E-02	12.0418	[.000]
E10E32	.084792	.520298E-02	16.2967	[.000]
E10E33	.072602	.552193E-02	13.1479	[.000]
E10E34	.031079	.258320E-02	12.0311	[.000]
E10E35	.089452	.527629E-02	16.9535	[.000]
E10E36	.030921	.257919E-02	11.9887	[.000]
E10E37	.030792	.257652E-02	11.9511	[.000]
E10E38	.029755	.249926E-02	11.9057	[.000]
E10E39	.030774	.257629E-02	11.9451	[.000]
E10E40	.028060	.249815E-02	11.2322	[.000]
E10E41	.029586	.249584E-02	11.8540	[.000]
E10E42	.030420	.257042E-02	11.8348	[.000]
E10E43	.030377	.257021E-02	11.8189	[.000]
E10E44	.030354	.256925E-02	11.8145	[.000]
E11E1	.064811	.807671E-02	8.02442	[.000]
E11E2	.059723	.710835E-02	8.40175	[.000]
E11E3	.058581	.676870E-02	8.65471	[.000]
E11E4	.044806	.435508E-02	10.2881	[.000]
E11E5	.043459	.390435E-02	11.1310	[.000]
E11E6	.043239	.392471E-02	11.0170	[.000]
E11E7	.040976	.353064E-02	11.6058	[.000]
E11E8	.039647	.335230E-02	11.8267	[.000]
E11E9	.039502	.338189E-02	11.6804	[.000]
E11E10	.039157	.335519E-02	11.6705	[.000]
E1111	-4.07297	.105993	-38.4269	[.000]
E11E12	.038163	.323457E-02	11.7983	[.000]
E11E13	.036627	.311028E-02	11.7760	[.000]
E11E14	.037793	.313449E-02	12.0571	[.000]
E11E15	.036487	.307236E-02	11.8759	[.000]
E11E16	.038082	.316576E-02	12.0294	[.000]

E11E17	.037024	.305659E-02	12.1129	[.000]
E11E18	.036340	.299687E-02	12.1262	[.000]
E11E19	.037216	.307527E-02	12.1017	[.000]
E11E20	.034012	.286815E-02	11.8586	[.000]
E11E21	.035467	.291613E-02	12.1623	[.000]
E11E22	.033731	.279373E-02	12.0737	[.000]
E11E23	.034998	.289156E-02	12.1035	[.000]
E11E24	.034896	.288482E-02	12.0965	[.000]
E11E25	.033682	.278483E-02	12.0947	[.000]
E11E26	.094751	.563133E-02	16.8257	[.000]
E11E27	.032851	.274805E-02	11.9542	[.000]
E11E28	.033900	.280340E-02	12.0924	[.000]
E11E29	.028492	.307001E-02	9.28069	[.000]
E11E30	.033208	.275751E-02	12.0428	[.000]
E11E31	.032429	.272289E-02	11.9097	[.000]
E11E32	.032735	.273293E-02	11.9779	[.000]
E11E33	.033982	.283344E-02	11.9932	[.000]
E11E34	.033841	.282634E-02	11.9734	[.000]
E11E35	.033058	.276008E-02	11.9773	[.000]
E11E36	.033648	.281788E-02	11.9410	[.000]
E11E37	.033481	.281071E-02	11.9120	[.000]
E11E38	.031762	.269415E-02	11.7892	[.000]
E11E39	.033457	.280982E-02	11.9072	[.000]
E11E40	.032032	.270267E-02	11.8521	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E11E41	.031545	.268624E-02	11.7433	[.000]
E11E42	.033012	.279396E-02	11.8157	[.000]
E11E43	.032955	.279228E-02	11.8021	[.000]
E11E44	.032938	.279201E-02	11.7974	[.000]
E12E1	.076783	.011520	6.66542	[.000]
E12E2	.069640	.010086	6.90447	[.000]
E12E3	.068493	.953242E-02	7.18524	[.000]
E12E4	.050639	.585771E-02	8.64484	[.000]
E12E5	.048412	.497900E-02	9.72329	[.000]
E12E6	.047931	.506133E-02	9.47002	[.000]
E12E7	.045095	.432777E-02	10.4200	[.000]
E12E8	.043341	.400702E-02	10.8162	[.000]
E12E9	.041979	.413503E-02	10.1520	[.000]
E12E10	.041752	.411425E-02	10.1481	[.000]
E12E11	.042077	.395764E-02	10.6320	[.000]
E1212	-4.88807	.158559	-30.8280	[.000]
E12E13	.107310	.630676E-02	17.0151	[.000]
E12E14	.040868	.359756E-02	11.3600	[.000]
E12E15	.040883	.366067E-02	11.1682	[.000]
E12E16	.041243	.365566E-02	11.2819	[.000]
E12E17	.039847	.344622E-02	11.5626	[.000]
E12E18	.038001	.338753E-02	11.2179	[.000]
E12E19	.040110	.348386E-02	11.5132	[.000]
E12E20	.103998	.604291E-02	17.2099	[.000]
E12E21	.037993	.325566E-02	11.6698	[.000]
E12E22	.194727	.017064	11.4115	[.000]
E12E23	.037155	.311226E-02	11.9383	[.000]
E12E24	.037026	.309896E-02	11.9478	[.000]
E12E25	.033695	.299030E-02	11.2682	[.000]
E12E26	.034805	.297355E-02	11.7048	[.000]
E12E27	.034533	.295966E-02	11.6678	[.000]
E12E28	.035407	.296714E-02	11.9330	[.000]
E12E29	.034600	.293047E-02	11.8071	[.000]
E12E30	.034488	.292038E-02	11.8094	[.000]
E12E31	.033889	.289855E-02	11.6917	[.000]

E12E32	.034727	.291014E-02	11.9329	[.000]
E12E33	.035804	.298762E-02	11.9840	[.000]
E12E34	.080454	.613454E-02	13.1150	[.000]
E12E35	.034356	.287711E-02	11.9413	[.000]
E12E36	.035362	.295404E-02	11.9708	[.000]
E12E37	.035149	.293937E-02	11.9582	[.000]
E12E38	.033055	.283349E-02	11.6657	[.000]
E12E39	.035119	.293740E-02	11.9558	[.000]
E12E40	.026794	.366219E-02	7.31642	[.000]
E12E41	.032772	.281431E-02	11.6446	[.000]
E12E42	.034527	.290128E-02	11.9007	[.000]
E12E43	.034453	.289747E-02	11.8906	[.000]
E12E44	.034416	.289496E-02	11.8883	[.000]
E13E1	.054784	.011623	4.71339	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E13E2	.051315	.010183	5.03925	[.000]
E13E3	.051092	.965156E-02	5.29367	[.000]
E13E4	.010657	.013045	.816981	[.414]
E13E5	.042168	.517783E-02	8.14392	[.000]
E13E6	.041612	.524373E-02	7.93564	[.000]
E13E7	.040680	.454954E-02	8.94160	[.000]
E13E8	.039895	.424223E-02	9.40427	[.000]
E13E9	.039193	.434279E-02	9.02475	[.000]
E13E10	.038925	.431073E-02	9.02980	[.000]
E13E11	.037632	.413205E-02	9.10744	[.000]
E13E12	.111832	.682052E-02	16.3965	[.000]
E1313	-3.73583	.144211	-25.9054	[.000]
E13E14	.038792	.385321E-02	10.0675	[.000]
E13E15	.038202	.388146E-02	9.84229	[.000]
E13E16	.038968	.390905E-02	9.96879	[.000]
E13E17	.038339	.371049E-02	10.3325	[.000]
E13E18	.037252	.364309E-02	10.2253	[.000]
E13E19	.038457	.374594E-02	10.2662	[.000]
E13E20	.278992	.029236	9.54283	[.000]
E13E21	.036816	.349976E-02	10.5195	[.000]
E13E22	.107499	.641374E-02	16.7608	[.000]
E13E23	.037140	.339691E-02	10.9333	[.000]
E13E24	.037080	.338415E-02	10.9569	[.000]
E13E25	.035578	.324592E-02	10.9607	[.000]
E13E26	.035596	.325116E-02	10.9487	[.000]
E13E27	.021064	.602293E-02	3.49731	[.000]
E13E28	.036103	.326522E-02	11.0568	[.000]
E13E29	.032960	.322113E-02	10.2324	[.000]
E13E30	.035670	.321954E-02	11.0793	[.000]
E13E31	.023941	.501254E-02	4.77628	[.000]
E13E32	.035043	.316826E-02	11.0606	[.000]
E13E33	.036544	.328074E-02	11.1389	[.000]
E13E34	.085686	.673164E-02	12.7288	[.000]
E13E35	.035675	.318561E-02	11.1987	[.000]
E13E36	.036341	.324859E-02	11.1866	[.000]
E13E37	.036248	.323475E-02	11.2057	[.000]
E13E38	.021708	.556012E-02	3.90425	[.000]
E13E39	.036236	.323303E-02	11.2082	[.000]
E13E40	.034260	.309298E-02	11.0766	[.000]
E13E41	.021395	.561326E-02	3.81156	[.000]
E13E42	.035973	.319899E-02	11.2453	[.000]
E13E43	.035943	.319545E-02	11.2482	[.000]
E13E44	.035924	.319331E-02	11.2498	[.000]
E14E1	.088319	.033819	2.61151	[.009]
E14E2	.904874E-02	.029124	.310700	[.756]

E14E3	.180475	.031421	5.74382	[.000]
E14E4	.022701	.016016	1.41735	[.156]
E14E5	.025071	.012900	1.94345	[.052]
E14E6	.025277	.013352	1.89315	[.058]

Parameter	Estimate	Standard Error	t-statistic	P-value
E14E7	.024700	.010586	2.33321	[.020]
E14E8	.114260	.011265	10.1428	[.000]
E14E9	.028808	.010148	2.83866	[.005]
E14E10	.028896	.010065	2.87085	[.004]
E14E11	.029627	.947818E-02	3.12577	[.002]
E14E12	.029802	.928662E-02	3.20912	[.001]
E14E13	.030660	.853545E-02	3.59203	[.000]
E1414	-15.9190	.397114	-40.0866	[.000]
E14E15	.031038	.821794E-02	3.77682	[.000]
E14E16	.028640	.795373E-02	3.60081	[.000]
E14E17	.214638	.019863	10.8061	[.000]
E14E18	.032017	.722701E-02	4.43018	[.000]
E14E19	.118093	.964225E-02	12.2475	[.000]
E14E20	.032968	.652801E-02	5.05026	[.000]
E14E21	.032803	.651942E-02	5.03164	[.000]
E14E22	.034092	.560227E-02	6.08539	[.000]
E14E23	.235971	.022311	10.5764	[.000]
E14E24	.028280	.548945E-02	5.15173	[.000]
E14E25	.034527	.522810E-02	6.60421	[.000]
E14E26	.034545	.526661E-02	6.55925	[.000]
E14E27	.034668	.519292E-02	6.67607	[.000]
E14E28	.034593	.508987E-02	6.79645	[.000]
E14E29	.034919	.501523E-02	6.96253	[.000]
E14E30	.034922	.495235E-02	7.05150	[.000]
E14E31	.035156	.484889E-02	7.25042	[.000]
E14E32	.035121	.479096E-02	7.33058	[.000]
E14E33	.032264	.466528E-02	6.91581	[.000]
E14E34	.033350	.457595E-02	7.28818	[.000]
E14E35	.035431	.455042E-02	7.78627	[.000]
E14E36	.021145	.635455E-02	3.32757	[.001]
E14E37	.033090	.434359E-02	7.61823	[.000]
E14E38	.035769	.445328E-02	8.03204	[.000]
E14E39	.033780	.433317E-02	7.79563	[.000]
E14E40	.035880	.436848E-02	8.21341	[.000]
E14E41	.035979	.432890E-02	8.31127	[.000]
E14E42	.034212	.407506E-02	8.39549	[.000]
E14E43	.034810	.405870E-02	8.57651	[.000]
E14E44	.136657	.863020E-02	15.8347	[.000]
E15E1	.058626	.012138	4.82983	[.000]
E15E2	.055174	.010665	5.17329	[.000]
E15E3	.054546	.010083	5.40947	[.000]
E15E4	.107047	.838571E-02	12.7654	[.000]
E15E5	.044594	.541694E-02	8.23233	[.000]
E15E6	.044319	.551638E-02	8.03404	[.000]
E15E7	.042979	.476444E-02	9.02077	[.000]
E15E8	.042097	.444319E-02	9.47452	[.000]
E15E9	.041894	.459247E-02	9.12241	[.000]
E15E10	.041677	.456268E-02	9.13423	[.000]
E15E11	.039989	.437342E-02	9.14374	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E15E12	.041200	.435971E-02	9.45017	[.000]
E15E13	.040508	.416105E-02	9.73503	[.000]
E15E14	.040890	.403857E-02	10.1248	[.000]
E1515	-4.63452	.143563	-32.2821	[.000]

E15E16	.041084	.409666E-02	10.0288	[.000]
E15E17	.040383	.388925E-02	10.3833	[.000]
E15E18	.039861	.386960E-02	10.3009	[.000]
E15E19	.040501	.392511E-02	10.3185	[.000]
E15E20	.038900	.369131E-02	10.5381	[.000]
E15E21	.039256	.371239E-02	10.5742	[.000]
E15E22	.038277	.351381E-02	10.8934	[.000]
E15E23	.039052	.356117E-02	10.9661	[.000]
E15E24	.038982	.354745E-02	10.9888	[.000]
E15E25	.038124	.345739E-02	11.0267	[.000]
E15E26	.037491	.342611E-02	10.9429	[.000]
E15E27	.037924	.343923E-02	11.0268	[.000]
E15E28	.038215	.345035E-02	11.0757	[.000]
E15E29	.037094	.337467E-02	10.9919	[.000]
E15E30	.037630	.339374E-02	11.0880	[.000]
E15E31	.037622	.338158E-02	11.1256	[.000]
E15E32	.037491	.336807E-02	11.1314	[.000]
E15E33	.038382	.343827E-02	11.1632	[.000]
E15E34	.038280	.342301E-02	11.1831	[.000]
E15E35	.037606	.335533E-02	11.2078	[.000]
E15E36	.038165	.340529E-02	11.2076	[.000]
E15E37	.038046	.338907E-02	11.2261	[.000]
E15E38	.097753	.668822E-02	14.6156	[.000]
E15E39	.038028	.338667E-02	11.2287	[.000]
E15E40	.097566	.668722E-02	14.5899	[.000]
E15E41	.097625	.668238E-02	14.6094	[.000]
E15E42	.037736	.335067E-02	11.2622	[.000]
E15E43	.037695	.334617E-02	11.2651	[.000]
E15E44	.037698	.334644E-02	11.2652	[.000]
E16E1	.060636	.754676E-02	8.03475	[.000]
E16E2	.059147	.675961E-02	8.75001	[.000]
E16E3	.054745	.639762E-02	8.55709	[.000]
E16E4	.049217	.450236E-02	10.9314	[.000]
E16E5	.108367	.725953E-02	14.9275	[.000]
E16E6	.046932	.411485E-02	11.4056	[.000]
E16E7	.039668	.385566E-02	10.2882	[.000]
E16E8	.042161	.357144E-02	11.8051	[.000]
E16E9	.044482	.374467E-02	11.8788	[.000]
E16E10	.044419	.373646E-02	11.8879	[.000]
E16E11	.044032	.368633E-02	11.9446	[.000]
E16E12	.043836	.366436E-02	11.9627	[.000]
E16E13	.043248	.359974E-02	12.0141	[.000]
E16E14	.040081	.341512E-02	11.7363	[.000]
E16E15	.043002	.357500E-02	12.0285	[.000]
E1616	-7.02417	.932684	-7.53113	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E16E17	.039166	.336854E-02	11.6270	[.000]
E16E18	.042015	.348556E-02	12.0540	[.000]
E16E19	.040319	.338338E-02	11.9167	[.000]
E16E20	.041516	.345187E-02	12.0272	[.000]
E16E21	.041381	.343830E-02	12.0353	[.000]
E16E22	.040618	.339875E-02	11.9508	[.000]
E16E23	.037888	.326664E-02	11.5986	[.000]
E16E24	.038668	.327197E-02	11.8180	[.000]
E16E25	.040191	.337688E-02	11.9017	[.000]
E16E26	.040288	.338473E-02	11.9030	[.000]
E16E27	.040241	.338487E-02	11.8885	[.000]
E16E28	.039941	.336035E-02	11.8859	[.000]
E16E29	.040057	.337848E-02	11.8566	[.000]
E16E30	.039907	.336714E-02	11.8518	[.000]

E16E31	.092937	.725291E-02	12.8138	[.000]
E16E32	.039730	.336161E-02	11.8187	[.000]
E16E33	.036177	.326559E-02	11.0782	[.000]
E16E34	.038236	.325678E-02	11.7403	[.000]
E16E35	.039371	.334598E-02	11.7666	[.000]
E16E36	.037094	.322984E-02	11.4848	[.000]
E16E37	.037848	.324536E-02	11.6621	[.000]
E16E38	.039416	.336171E-02	11.7249	[.000]
E16E39	.037976	.325139E-02	11.6798	[.000]
E16E40	.039276	.335610E-02	11.7029	[.000]
E16E41	.039258	.335914E-02	11.6870	[.000]
E16E42	.037594	.324395E-02	11.5889	[.000]
E16E43	.103645	.681171E-02	15.2157	[.000]
E16E44	.035159	.326332E-02	10.7741	[.000]
E17E1	.198199	.011209	17.6816	[.000]
E17E2	.089694	.804108E-02	11.1545	[.000]
E17E3	.259960	.017617	14.7559	[.000]
E17E4	.068544	.541280E-02	12.6634	[.000]
E17E5	.062317	.482414E-02	12.9177	[.000]
E17E6	.063914	.494980E-02	12.9124	[.000]
E17E7	.054016	.454885E-02	11.8746	[.000]
E17E8	.159530	.866092E-02	18.4195	[.000]
E17E9	.058646	.449515E-02	13.0466	[.000]
E17E10	.058503	.448421E-02	13.0463	[.000]
E17E11	.057587	.441881E-02	13.0322	[.000]
E17E12	.057221	.439210E-02	13.0282	[.000]
E17E13	.055938	.430707E-02	12.9875	[.000]
E17E14	.258571	.021403	12.0810	[.000]
E17E15	.055396	.427384E-02	12.9617	[.000]
E17E16	.051692	.410972E-02	12.5779	[.000]
E1717	-5.74625	.097773	-58.7716	[.000]
E17E18	.053464	.415707E-02	12.8609	[.000]
E17E19	.158046	.875721E-02	18.0476	[.000]
E17E20	.052282	.410537E-02	12.7350	[.000]
E17E21	.052101	.408747E-02	12.7466	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E17E22	.050426	.402738E-02	12.5209	[.000]
E17E23	.449819	.052086	8.63605	[.000]
E17E24	.043268	.414097E-02	10.4489	[.000]
E17E25	.049581	.399442E-02	12.4127	[.000]
E17E26	.049725	.400394E-02	12.4190	[.000]
E17E27	.049589	.400165E-02	12.3922	[.000]
E17E28	.049168	.397279E-02	12.3761	[.000]
E17E29	.049197	.399001E-02	12.3301	[.000]
E17E30	.048976	.397682E-02	12.3154	[.000]
E17E31	.048816	.397943E-02	12.2672	[.000]
E17E32	.048578	.396376E-02	12.2556	[.000]
E17E33	.044156	.386603E-02	11.4214	[.000]
E17E34	.045709	.381405E-02	11.9843	[.000]
E17E35	.047940	.394330E-02	12.1574	[.000]
E17E36	.027660	.770568E-02	3.58959	[.000]
E17E37	.044334	.380763E-02	11.6435	[.000]
E17E38	.047846	.395644E-02	12.0932	[.000]
E17E39	.045182	.380060E-02	11.8882	[.000]
E17E40	.047595	.394862E-02	12.0537	[.000]
E17E41	.047514	.394985E-02	12.0293	[.000]
E17E42	.044456	.378677E-02	11.7399	[.000]
E17E43	.045117	.380282E-02	11.8641	[.000]
E17E44	.184716	.012137	15.2191	[.000]
E18E1	.055642	.013018	4.27419	[.000]

E18E2	.048253	.011501	4.19574	[.000]
E18E3	.053184	.010819	4.91559	[.000]
E18E4	.047226	.682027E-02	6.92437	[.000]
E18E5	.047297	.589500E-02	8.02323	[.000]
E18E6	.144124	.950802E-02	15.1582	[.000]
E18E7	.046272	.522230E-02	8.86056	[.000]
E18E8	.045762	.489971E-02	9.33978	[.000]
E18E9	.040992	.509535E-02	8.04505	[.000]
E18E10	.041630	.502975E-02	8.27681	[.000]
E18E11	.044768	.485358E-02	9.22379	[.000]
E18E12	.043038	.476807E-02	9.02638	[.000]
E18E13	.044061	.459929E-02	9.57985	[.000]
E18E14	.045023	.449685E-02	10.0122	[.000]
E18E15	.044654	.455954E-02	9.79350	[.000]
E18E16	.045135	.455307E-02	9.91316	[.000]
E18E17	.044721	.435180E-02	10.2765	[.000]
E1818	-5.85963	.287311	-20.3948	[.000]
E18E19	.044807	.438814E-02	10.2110	[.000]
E18E20	.043151	.414458E-02	10.4115	[.000]
E18E21	.042812	.413113E-02	10.3633	[.000]
E18E22	.041373	.393770E-02	10.5069	[.000]
E18E23	.043926	.404233E-02	10.8666	[.000]
E18E24	.105675	.827902E-02	12.7642	[.000]
E18E25	.035736	.439372E-02	8.13342	[.000]
E18E26	.042167	.389808E-02	10.8173	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E18E27	.042463	.390040E-02	10.8869	[.000]
E18E28	.143361	.851487E-02	16.8365	[.000]
E18E29	.042513	.388026E-02	10.9563	[.000]
E18E30	.041010	.383039E-02	10.7064	[.000]
E18E31	.042271	.384750E-02	10.9866	[.000]
E18E32	.041915	.382572E-02	10.9561	[.000]
E18E33	.043530	.393276E-02	11.0686	[.000]
E18E34	.043491	.392208E-02	11.0887	[.000]
E18E35	.040645	.377296E-02	10.7728	[.000]
E18E36	.105228	.821314E-02	12.8122	[.000]
E18E37	.105047	.821294E-02	12.7905	[.000]
E18E38	.042026	.379257E-02	11.0811	[.000]
E18E39	.043341	.389129E-02	11.1379	[.000]
E18E40	.040642	.374715E-02	10.8461	[.000]
E18E41	.041942	.377686E-02	11.1051	[.000]
E18E42	.043166	.386175E-02	11.1777	[.000]
E18E43	.043152	.385936E-02	11.1812	[.000]
E18E44	.043117	.385551E-02	11.1833	[.000]
E19E1	.307230	.039250	7.82760	[.000]
E19E2	.058633	.026011	2.25414	[.024]
E19E3	.146833	.025110	5.84772	[.000]
E19E4	.051117	.014407	3.54818	[.000]
E19E5	.047592	.011651	4.08467	[.000]
E19E6	.049307	.012064	4.08729	[.000]
E19E7	.044222	.963865E-02	4.58801	[.000]
E19E8	.577322	.073216	7.88516	[.000]
E19E9	.047488	.927165E-02	5.12181	[.000]
E19E10	.047432	.919960E-02	5.15590	[.000]
E19E11	.047158	.869335E-02	5.42463	[.000]
E19E12	.047013	.852823E-02	5.51267	[.000]
E19E13	.046568	.788371E-02	5.90692	[.000]
E19E14	.139467	.990661E-02	14.0782	[.000]
E19E15	.046371	.761182E-02	6.09192	[.000]
E19E16	.044146	.737062E-02	5.98946	[.000]

E19E17	.146951	.989428E-02	14.8521	[.000]
E19E18	.045599	.676981E-02	6.73564	[.000]
E1919	-8.65588	1.10419	-7.83912	[.000]
E19E20	.045248	.618611E-02	7.31449	[.000]
E19E21	.045075	.617579E-02	7.29862	[.000]
E19E22	.044560	.542279E-02	8.21720	[.000]
E19E23	.146494	.917154E-02	15.9727	[.000]
E19E24	.039273	.524710E-02	7.48474	[.000]
E19E25	.044219	.511882E-02	8.63844	[.000]
E19E26	.044303	.515057E-02	8.60151	[.000]
E19E27	.044279	.509289E-02	8.69426	[.000]
E19E28	.043995	.500527E-02	8.78980	[.000]
E19E29	.044132	.495031E-02	8.91498	[.000]
E19E30	.043994	.489763E-02	8.98276	[.000]
E19E31	.044000	.481886E-02	9.13087	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E19E32	.043835	.476956E-02	9.19054	[.000]
E19E33	.039400	.468398E-02	8.41155	[.000]
E19E34	.036096	.494697E-02	7.29651	[.000]
E19E35	.043566	.457890E-02	9.51457	[.000]
E19E36	.039243	.451342E-02	8.69479	[.000]
E19E37	.028916	.633329E-02	4.56573	[.000]
E19E38	.043650	.450918E-02	9.68026	[.000]
E19E39	.036357	.470014E-02	7.73539	[.000]
E19E40	.043539	.444255E-02	9.80044	[.000]
E19E41	.043530	.441325E-02	9.86352	[.000]
E19E42	.036047	.452273E-02	7.97016	[.000]
E19E43	.039499	.416865E-02	9.47525	[.000]
E19E44	.149131	.897918E-02	16.6085	[.000]
E20E1	.072931	.860646E-02	8.47403	[.000]
E20E2	.068578	.767264E-02	8.93794	[.000]
E20E3	.068481	.739287E-02	9.26308	[.000]
E20E4	.039686	.834634E-02	4.75493	[.000]
E20E5	.057724	.500726E-02	11.5282	[.000]
E20E6	.056882	.496567E-02	11.4551	[.000]
E20E7	.055929	.474918E-02	11.7766	[.000]
E20E8	.054981	.463609E-02	11.8594	[.000]
E20E9	.053881	.457194E-02	11.7851	[.000]
E20E10	.053486	.454829E-02	11.7596	[.000]
E20E11	.051359	.446725E-02	11.4969	[.000]
E20E12	.155765	.901757E-02	17.2734	[.000]
E20E13	.392999	.040876	9.61445	[.000]
E20E14	.053652	.450823E-02	11.9009	[.000]
E20E15	.052667	.442426E-02	11.9041	[.000]
E20E16	.053867	.452666E-02	11.8999	[.000]
E20E17	.053105	.446685E-02	11.8887	[.000]
E20E18	.051572	.434014E-02	11.8825	[.000]
E20E19	.053247	.447704E-02	11.8933	[.000]
E2020	-6.60666	.143866	-45.9225	[.000]
E20E21	.051042	.430423E-02	11.8585	[.000]
E20E22	.150789	.890588E-02	16.9314	[.000]
E20E23	.051659	.439041E-02	11.7664	[.000]
E20E24	.051587	.438769E-02	11.7572	[.000]
E20E25	.049506	.423250E-02	11.6966	[.000]
E20E26	.049414	.422790E-02	11.6875	[.000]
E20E27	.037785	.575646E-02	6.56394	[.000]
E20E28	.050265	.428374E-02	11.7339	[.000]
E20E29	.044747	.436616E-02	10.2486	[.000]
E20E30	.049633	.424687E-02	11.6870	[.000]
E20E31	.039285	.529189E-02	7.42370	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E20E32	.048772	.420939E-02	11.5865	[.000]
E20E33	.050942	.437180E-02	11.6525	[.000]
E20E34	.120023	.944822E-02	12.7033	[.000]
E20E35	.049746	.427683E-02	11.6316	[.000]
E20E36	.050696	.436703E-02	11.6089	[.000]
E20E37	.050584	.436618E-02	11.5854	[.000]
E20E38	.037718	.556091E-02	6.78262	[.000]
E20E39	.050571	.436652E-02	11.5814	[.000]
E20E40	.047784	.418893E-02	11.4073	[.000]
E20E41	.037459	.558759E-02	6.70390	[.000]
E20E42	.050254	.436486E-02	11.5132	[.000]
E20E43	.050218	.436550E-02	11.5033	[.000]
E20E44	.050195	.436446E-02	11.5007	[.000]
E21E1	.080195	.844465E-02	9.49658	[.000]
E21E2	.164430	.010828	15.1852	[.000]
E21E3	.074382	.725323E-02	10.2551	[.000]
E21E4	.061998	.524933E-02	11.8106	[.000]
E21E5	.060375	.493337E-02	12.2380	[.000]
E21E6	.058650	.487032E-02	12.0424	[.000]
E21E7	.129174	.950265E-02	13.5934	[.000]
E21E8	.056759	.457674E-02	12.4016	[.000]
E21E9	.056184	.454713E-02	12.3560	[.000]
E21E10	.055752	.452426E-02	12.3230	[.000]
E21E11	.055661	.449615E-02	12.3796	[.000]
E21E12	.055350	.447404E-02	12.3713	[.000]
E21E13	.054480	.441061E-02	12.3521	[.000]
E21E14	.055019	.445707E-02	12.3443	[.000]
E21E15	.054830	.443031E-02	12.3760	[.000]
E21E16	.055324	.447677E-02	12.3580	[.000]
E21E17	.054308	.441946E-02	12.2884	[.000]
E21E18	.052621	.430403E-02	12.2259	[.000]
E21E19	.054495	.442897E-02	12.3042	[.000]
E21E20	.052295	.428775E-02	12.1964	[.000]
E2121	-3.75487	.132331	-28.3748	[.000]
E21E22	.051338	.425807E-02	12.0566	[.000]
E21E23	.052419	.435183E-02	12.0454	[.000]
E21E24	.052319	.434890E-02	12.0303	[.000]
E21E25	.050558	.423036E-02	11.9513	[.000]
E21E26	.051158	.426356E-02	11.9990	[.000]
E21E27	.050716	.424035E-02	11.9603	[.000]
E21E28	.050400	.422772E-02	11.9213	[.000]
E21E29	.050531	.423909E-02	11.9202	[.000]
E21E30	.050548	.424355E-02	11.9118	[.000]
E21E31	.050263	.423353E-02	11.8726	[.000]
E21E32	.045472	.434712E-02	10.4603	[.000]
E21E33	.051498	.433918E-02	11.8682	[.000]
E21E34	.051362	.433708E-02	11.8426	[.000]
E21E35	.050048	.424138E-02	11.7998	[.000]
E21E36	.051161	.433390E-02	11.8048	[.000]
E21E37	.051017	.433412E-02	11.7710	[.000]
E21E38	.049680	.422843E-02	11.7490	[.000]
E21E39	.051006	.433526E-02	11.7653	[.000]
E21E40	.049739	.423939E-02	11.7325	[.000]
E21E41	.049481	.422786E-02	11.7036	[.000]
E21E42	.050593	.433548E-02	11.6696	[.000]
E21E43	.050552	.433716E-02	11.6557	[.000]
E21E44	.050516	.433533E-02	11.6522	[.000]

E22E1	.068659	.018943	3.62456	[.000]
E22E2	.065131	.016618	3.91925	[.000]
E22E3	.067210	.015744	4.26884	[.000]
E22E4	.060716	.988635E-02	6.14143	[.000]
E22E5	.063745	.856563E-02	7.44196	[.000]
E22E6	.061671	.865951E-02	7.12172	[.000]
E22E7	.063132	.758303E-02	8.32544	[.000]
E22E8	.062829	.710903E-02	8.83797	[.000]
E22E9	.057731	.726543E-02	7.94599	[.000]
E22E10	.057353	.724323E-02	7.91810	[.000]
E22E11	.060050	.698896E-02	8.59215	[.000]
E22E12	.368597	.033369	11.0462	[.000]
E22E13	.186362	.011852	15.7246	[.000]
E22E14	.062395	.651697E-02	9.57416	[.000]
E22E15	.061106	.657131E-02	9.29898	[.000]
E22E16	.062464	.659999E-02	9.46426	[.000]
E22E17	.062216	.630287E-02	9.87103	[.000]
E22E18	.058348	.616268E-02	9.46796	[.000]
E22E19	.062266	.635582E-02	9.79666	[.000]
E22E20	.186178	.011511	16.1735	[.000]
E22E21	.060299	.599763E-02	10.0538	[.000]
E2222	-1.90245	.445333	-4.27197	[.000]
E22E23	.061747	.584371E-02	10.5664	[.000]
E22E24	.061727	.582599E-02	10.5951	[.000]
E22E25	.055643	.563840E-02	9.86865	[.000]
E22E26	.056974	.559859E-02	10.1766	[.000]
E22E27	.057986	.557397E-02	10.4031	[.000]
E22E28	.059549	.559777E-02	10.6381	[.000]
E22E29	.058208	.553477E-02	10.5168	[.000]
E22E30	.057738	.551739E-02	10.4647	[.000]
E22E31	.057918	.549391E-02	10.5422	[.000]
E22E32	.059317	.552231E-02	10.7412	[.000]
E22E33	.061514	.567936E-02	10.8311	[.000]
E22E34	.148639	.011863	12.5298	[.000]
E22E35	.059315	.547637E-02	10.8310	[.000]
E22E36	.061434	.563628E-02	10.8998	[.000]
E22E37	.061403	.561776E-02	10.9302	[.000]
E22E38	.057744	.540979E-02	10.6740	[.000]
E22E39	.061402	.561537E-02	10.9346	[.000]
E22E40	.032152	.011037	2.91302	[.004]
E22E41	.057692	.538557E-02	10.7124	[.000]
E22E42	.061298	.557039E-02	11.0043	[.000]
E22E43	.061293	.556598E-02	11.0120	[.000]
E22E44	.061270	.556240E-02	11.0149	[.000]
E23E1	.209367	.023142	9.04718	[.000]
E23E2	.061788	.019085	3.23758	[.001]
Parameter	Estimate	Standard Error	t-statistic	P-value
E23E3	.297872	.025581	11.6442	[.000]
E23E4	.062475	.011252	5.55214	[.000]
E23E5	.060989	.947541E-02	6.43660	[.000]
E23E6	.062225	.976180E-02	6.37437	[.000]
E23E7	.055447	.833724E-02	6.65055	[.000]
E23E8	.212121	.013066	16.2349	[.000]
E23E9	.062524	.811588E-02	7.70386	[.000]
E23E10	.062523	.807529E-02	7.74256	[.000]
E23E11	.062688	.780259E-02	8.03423	[.000]
E23E12	.062642	.770965E-02	8.12516	[.000]
E23E13	.062713	.736953E-02	8.50973	[.000]
E23E14	.391102	.035437	11.0366	[.000]
E23E15	.062754	.723146E-02	8.67797	[.000]

E23E16	.058276	.698920E-02	8.33796	[.000]
E23E17	.644330	.075234	8.56434	[.000]
E23E18	.062561	.680006E-02	9.20012	[.000]
E23E19	.215674	.012918	16.6950	[.000]
E23E20	.062781	.654235E-02	9.59615	[.000]
E23E21	.062516	.651988E-02	9.58845	[.000]
E23E22	.062770	.621300E-02	10.1030	[.000]
E2323	-4.19449	.467626	-8.96975	[.000]
E23E24	.051418	.659398E-02	7.79770	[.000]
E23E25	.062691	.608622E-02	10.3005	[.000]
E23E26	.062791	.610630E-02	10.2831	[.000]
E23E27	.062833	.608683E-02	10.3227	[.000]
E23E28	.062510	.602936E-02	10.3676	[.000]
E23E29	.062842	.603357E-02	10.4153	[.000]
E23E30	.062712	.600414E-02	10.4448	[.000]
E23E31	.062848	.598535E-02	10.5002	[.000]
E23E32	.062671	.595401E-02	10.5258	[.000]
E23E33	.056827	.580539E-02	9.78868	[.000]
E23E34	.058892	.573109E-02	10.2760	[.000]
E23E35	.062592	.588083E-02	10.6433	[.000]
E23E36	.013686	.018131	.754829	[.450]
E23E37	.057619	.568570E-02	10.1341	[.000]
E23E38	.062866	.587843E-02	10.6943	[.000]
E23E39	.059012	.566483E-02	10.4173	[.000]
E23E40	.062824	.585299E-02	10.7337	[.000]
E23E41	.062872	.584726E-02	10.7524	[.000]
E23E42	.058997	.559913E-02	10.5368	[.000]
E23E43	.060111	.561383E-02	10.7076	[.000]
E23E44	.249841	.015933	15.6811	[.000]
E24E1	.080083	.019741	4.05667	[.000]
E24E2	.083421	.017401	4.79407	[.000]
E24E3	.075681	.016408	4.61229	[.000]
E24E4	.074854	.010466	7.15219	[.000]
E24E5	.071058	.889446E-02	7.98905	[.000]
E24E6	.168215	.014281	11.7790	[.000]
E24E7	.066431	.781028E-02	8.50557	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E24E8	.062761	.741305E-02	8.46634	[.000]
E24E9	.070661	.776726E-02	9.09734	[.000]
E24E10	.070595	.773272E-02	9.12944	[.000]
E24E11	.070314	.750674E-02	9.36674	[.000]
E24E12	.070134	.742861E-02	9.44101	[.000]
E24E13	.069630	.714657E-02	9.74307	[.000]
E24E14	.058919	.704921E-02	8.35826	[.000]
E24E15	.069421	.703276E-02	9.87113	[.000]
E24E16	.066167	.678150E-02	9.75694	[.000]
E24E17	.058471	.682713E-02	8.56457	[.000]
E24E18	.162474	.012871	12.6232	[.000]
E24E19	.060772	.665731E-02	9.12858	[.000]
E24E20	.068114	.647111E-02	10.5258	[.000]
E24E21	.067834	.644523E-02	10.5246	[.000]
E24E22	.067318	.620825E-02	10.8433	[.000]
E24E23	.055594	.659762E-02	8.42636	[.000]
E2424	-2.93759	.294369	-9.97927	[.000]
E24E25	.066902	.610658E-02	10.9558	[.000]
E24E26	.067030	.612451E-02	10.9446	[.000]
E24E27	.067000	.611018E-02	10.9652	[.000]
E24E28	.161959	.012498	12.9589	[.000]
E24E29	.066835	.606855E-02	11.0134	[.000]
E24E30	.066656	.604285E-02	11.0305	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E24E31	.066680	.603159E-02	11.0551	[.000]
E24E32	.066439	.600137E-02	11.0707	[.000]
E24E33	.062021	.578875E-02	10.7141	[.000]
E24E34	.061718	.577155E-02	10.6935	[.000]
E24E35	.066134	.594528E-02	11.1238	[.000]
E24E36	.293918	.021085	13.9400	[.000]
E24E37	.226460	.013518	16.7524	[.000]
E24E38	.066277	.595000E-02	11.1391	[.000]
E24E39	.061607	.572013E-02	10.7702	[.000]
E24E40	.066146	.593007E-02	11.1543	[.000]
E24E41	.066140	.592658E-02	11.1598	[.000]
E24E42	.061415	.567130E-02	10.8290	[.000]
E24E43	.062756	.568043E-02	11.0478	[.000]
E24E44	.059786	.570693E-02	10.4760	[.000]
E25E1	.086174	.011528	7.47533	[.000]
E25E2	.078097	.010321	7.56661	[.000]
E25E3	.082857	.992923E-02	8.34479	[.000]
E25E4	.074044	.723249E-02	10.2377	[.000]
E25E5	.074898	.685250E-02	10.9300	[.000]
E25E6	.070852	.673919E-02	10.5135	[.000]
E25E7	.073519	.653154E-02	11.2561	[.000]
E25E8	.072829	.639635E-02	11.3861	[.000]
E25E9	.317124	.022789	13.9153	[.000]
E25E10	.276423	.017698	15.6193	[.000]
E25E11	.070833	.625496E-02	11.3243	[.000]
E25E12	.066286	.624157E-02	10.6200	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E25E13	.069760	.613586E-02	11.3692	[.000]
E25E14	.071835	.624528E-02	11.5023	[.000]
E25E15	.070958	.618431E-02	11.4739	[.000]
E25E16	.071984	.626479E-02	11.4903	[.000]
E25E17	.071426	.619780E-02	11.5244	[.000]
E25E18	.058466	.686987E-02	8.51050	[.000]
E25E19	.071539	.620995E-02	11.5201	[.000]
E25E20	.068520	.598088E-02	11.4565	[.000]
E25E21	.068747	.599105E-02	11.4750	[.000]
E25E22	.063782	.596701E-02	10.6890	[.000]
E25E23	.070352	.611660E-02	11.5019	[.000]
E25E24	.070307	.611500E-02	11.4975	[.000]
E2525	-6.09494	.129720	-46.9853	[.000]
E25E26	.066522	.589069E-02	11.2926	[.000]
E25E27	.067628	.592297E-02	11.4180	[.000]
E25E28	.065723	.588106E-02	11.1754	[.000]
E25E29	.067695	.592775E-02	11.4200	[.000]
E25E30	.222712	.013113	16.9845	[.000]
E25E31	.067378	.591555E-02	11.3900	[.000]
E25E32	.193475	.012407	15.5944	[.000]
E25E33	.168738	.013164	12.8179	[.000]
E25E34	.069760	.610124E-02	11.4337	[.000]
E25E35	.207730	.012541	16.5647	[.000]
E25E36	.069638	.609846E-02	11.4189	[.000]
E25E37	.069564	.609959E-02	11.4047	[.000]
E25E38	.067041	.591090E-02	11.3419	[.000]
E25E39	.069557	.610026E-02	11.4024	[.000]
E25E40	.062559	.595195E-02	10.5107	[.000]
E25E41	.066927	.591086E-02	11.3228	[.000]
E25E42	.069320	.610185E-02	11.3605	[.000]
E25E43	.069301	.610363E-02	11.3541	[.000]
E25E44	.069258	.610031E-02	11.3531	[.000]
E26E1	.086074	.872847E-02	9.86126	[.000]

E26E2	.081381	.792939E-02	10.2633	[.000]
E26E3	.082675	.777785E-02	10.6296	[.000]
E26E4	.073624	.625315E-02	11.7740	[.000]
E26E5	.074400	.619264E-02	12.0142	[.000]
E26E6	.072490	.606073E-02	11.9605	[.000]
E26E7	.073033	.607140E-02	12.0290	[.000]
E26E8	.072305	.602642E-02	11.9980	[.000]
E26E9	.068312	.583105E-02	11.7152	[.000]
E26E10	.067352	.584211E-02	11.5287	[.000]
E26E11	.204832	.012257	16.7108	[.000]
E26E12	.067997	.579781E-02	11.7280	[.000]
E26E13	.069138	.580968E-02	11.9004	[.000]
E26E14	.071299	.598892E-02	11.9052	[.000]
E26E15	.069096	.580897E-02	11.8947	[.000]
E26E16	.071456	.599331E-02	11.9226	[.000]
E26E17	.070875	.598079E-02	11.8505	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E26E18	.068166	.577938E-02	11.7948	[.000]
E26E19	.070975	.598153E-02	11.8657	[.000]
E26E20	.067702	.577400E-02	11.7254	[.000]
E26E21	.068875	.583692E-02	11.7998	[.000]
E26E22	.064629	.575455E-02	11.2310	[.000]
E26E23	.069767	.598378E-02	11.6593	[.000]
E26E24	.069713	.598481E-02	11.6483	[.000]
E26E25	.065838	.575471E-02	11.4408	[.000]
E2626	-10.5151	.439435	-23.9287	[.000]
E26E27	.067113	.579784E-02	11.5755	[.000]
E26E28	.067536	.582641E-02	11.5913	[.000]
E26E29	.065904	.576307E-02	11.4356	[.000]
E26E30	.063013	.580322E-02	10.8583	[.000]
E26E31	.066899	.580778E-02	11.5189	[.000]
E26E32	.067094	.582158E-02	11.5251	[.000]
E26E33	.069203	.599740E-02	11.5389	[.000]
E26E34	.069128	.599980E-02	11.5217	[.000]
E26E35	.066605	.581318E-02	11.4575	[.000]
E26E36	.069029	.600452E-02	11.4961	[.000]
E26E37	.068932	.600732E-02	11.4747	[.000]
E26E38	.066523	.581778E-02	11.4345	[.000]
E26E39	.068918	.600782E-02	11.4714	[.000]
E26E40	.063501	.578261E-02	10.9814	[.000]
E26E41	.066404	.582241E-02	11.4048	[.000]
E26E42	.068674	.601855E-02	11.4104	[.000]
E26E43	.068644	.602039E-02	11.4019	[.000]
E26E44	.068635	.602099E-02	11.3992	[.000]
E27E1	.107513	.013412	8.01647	[.000]
E27E2	.100859	.011927	8.45639	[.000]
E27E3	.100517	.011479	8.75672	[.000]
E27E4	.042216	.017136	2.46356	[.014]
E27E5	.083621	.753686E-02	11.0950	[.000]
E27E6	.082499	.749107E-02	11.0130	[.000]
E27E7	.080797	.707533E-02	11.4196	[.000]
E27E8	.079311	.686598E-02	11.5514	[.000]
E27E9	.077902	.680035E-02	11.4556	[.000]
E27E10	.077431	.676537E-02	11.4451	[.000]
E27E11	.075424	.661612E-02	11.4000	[.000]
E27E12	.074459	.657359E-02	11.3271	[.000]
E27E13	.046476	.012081	3.84709	[.000]
E27E14	.077220	.661787E-02	11.6683	[.000]
E27E15	.076168	.653197E-02	11.6607	[.000]
E27E16	.077555	.665373E-02	11.6558	[.000]

		Standard		
Parameter	Estimate	Error	t-statistic	P-value
E27E17	.076361	.653316E-02	11.6882	[.000]
E27E18	.074172	.635035E-02	11.6799	[.000]
E27E19	.076587	.655452E-02	11.6846	[.000]
E27E20	.056205	.830615E-02	6.76670	[.000]
E27E21	.073383	.627589E-02	11.6928	[.000]
E27E22	.070047	.610500E-02	11.4736	[.000]
		Standard		
Parameter	Estimate	Error	t-statistic	P-value
E27E23	.074090	.636106E-02	11.6474	[.000]
E27E24	.073977	.635444E-02	11.6418	[.000]
E27E25	.071007	.612231E-02	11.5981	[.000]
E27E26	.071221	.613339E-02	11.6120	[.000]
E2727	-5.14707	.164719	-31.2476	[.000]
E27E28	.072053	.619230E-02	11.6360	[.000]
E27E29	.231308	.013540	17.0837	[.000]
E27E30	.071290	.614296E-02	11.6052	[.000]
E27E31	-.134546E-02	.027265	-.049347	[.961]
E27E32	.070080	.607935E-02	11.5276	[.000]
E27E33	.072964	.630628E-02	11.5700	[.000]
E27E34	.072812	.630035E-02	11.5569	[.000]
E27E35	.071270	.616435E-02	11.5616	[.000]
E27E36	.072577	.629060E-02	11.5374	[.000]
E27E37	.072403	.628559E-02	11.5189	[.000]
E27E38	-.044046	.043051	-1.02311	[.306]
E27E39	.170915	.013497	12.6635	[.000]
E27E40	.068525	.602639E-02	11.3709	[.000]
E27E41	-.050245	.045307	-1.10897	[.267]
E27E42	.170409	.013487	12.6352	[.000]
E27E43	.071828	.627180E-02	11.4526	[.000]
E27E44	.071788	.626928E-02	11.4508	[.000]
E28E1	.087896	.018661	4.71004	[.000]
E28E2	.065887	.017567	3.75067	[.000]
E28E3	.084794	.015605	5.43366	[.000]
E28E4	.077806	.010167	7.65243	[.000]
E28E5	.077420	.894231E-02	8.65769	[.000]
E28E6	.293601	.019907	14.7484	[.000]
E28E7	.076081	.807543E-02	9.42132	[.000]
E28E8	.075454	.767158E-02	9.83551	[.000]
E28E9	.071550	.775709E-02	9.22384	[.000]
E28E10	.072006	.772886E-02	9.31649	[.000]
E28E11	.074499	.762269E-02	9.77333	[.000]
E28E12	.073276	.750439E-02	9.76435	[.000]
E28E13	.073814	.731559E-02	10.0900	[.000]
E28E14	.074519	.717666E-02	10.3836	[.000]
E28E15	.074199	.725834E-02	10.2225	[.000]
E28E16	.074649	.724380E-02	10.3052	[.000]
E28E17	.074135	.700226E-02	10.5873	[.000]
E28E18	.242274	.014546	16.6563	[.000]
E28E19	.074250	.704631E-02	10.5375	[.000]
E28E20	.072657	.677248E-02	10.7283	[.000]
E28E21	.071604	.671412E-02	10.6647	[.000]
E28E22	.071095	.651447E-02	10.9134	[.000]
E28E23	.073135	.664162E-02	11.0117	[.000]
E28E24	.178721	.013820	12.9325	[.000]
E28E25	.068625	.639095E-02	10.7378	[.000]
E28E26	.071258	.647058E-02	11.0126	[.000]
E28E27	.071811	.649574E-02	11.0551	[.000]
		Standard		
Parameter	Estimate	Error	t-statistic	P-value
E2828	-3.98193	.283492	-14.0460	[.000]
E28E29	.071746	.646934E-02	11.0902	[.000]

E28E30	.069542	.635456E-02	10.9437	[.000]
E28E31	.071569	.643808E-02	11.1166	[.000]
E28E32	.070755	.638103E-02	11.0883	[.000]
E28E33	.072629	.651910E-02	11.1409	[.000]
E28E34	.072600	.650980E-02	11.1525	[.000]
E28E35	.064881	.640266E-02	10.1335	[.000]
E28E36	.178236	.013739	12.9729	[.000]
E28E37	.177915	.013744	12.9450	[.000]
E28E38	.071260	.637971E-02	11.1698	[.000]
E28E39	.072412	.647713E-02	11.1797	[.000]
E28E40	.070149	.630494E-02	11.1261	[.000]
E28E41	.071155	.636354E-02	11.1817	[.000]
E28E42	.072190	.644661E-02	11.1981	[.000]
E28E43	.072182	.644535E-02	11.1991	[.000]
E28E44	.072109	.643805E-02	11.2004	[.000]
E29E1	.095943	.016371	5.86060	[.000]
E29E2	.091329	.014487	6.30437	[.000]
E29E3	.091898	.013864	6.62868	[.000]
E29E4	.076718	.932462E-02	8.22745	[.000]
E29E5	.082100	.856441E-02	9.58614	[.000]
E29E6	.080649	.855654E-02	9.42539	[.000]
E29E7	.080465	.791278E-02	10.1690	[.000]
E29E8	.079593	.760904E-02	10.4603	[.000]
E29E9	.077621	.759336E-02	10.2222	[.000]
E29E10	.076923	.754014E-02	10.2018	[.000]
E29E11	.065513	.806609E-02	8.12202	[.000]
E29E12	.075454	.731391E-02	10.3165	[.000]
E29E13	.070847	.720129E-02	9.83803	[.000]
E29E14	.078388	.724538E-02	10.8191	[.000]
E29E15	.075628	.710337E-02	10.6468	[.000]
E29E16	.078594	.729776E-02	10.7696	[.000]
E29E17	.077890	.711802E-02	10.9426	[.000]
E29E18	.075733	.694881E-02	10.8988	[.000]
E29E19	.078013	.714870E-02	10.9129	[.000]
E29E20	.067630	.695147E-02	9.72892	[.000]
E29E21	.075168	.682018E-02	11.0214	[.000]
E29E22	.072512	.659417E-02	10.9963	[.000]
E29E23	.076572	.685413E-02	11.1717	[.000]
E29E24	.076502	.684348E-02	11.1789	[.000]
E29E25	.073685	.660106E-02	11.1627	[.000]
E29E26	.072500	.655548E-02	11.0594	[.000]
E29E27	.244717	.014314	17.0969	[.000]
E29E28	.074746	.666337E-02	11.2174	[.000]
E2929	-4.51180	.210161	-21.4683	[.000]
E29E30	.073555	.657354E-02	11.1896	[.000]
E29E31	.069815	.650045E-02	10.7401	[.000]
E29E32	.072529	.651375E-02	11.1348	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E29E33	.075921	.676502E-02	11.2226	[.000]
E29E34	.075823	.675421E-02	11.2261	[.000]
E29E35	.074207	.660028E-02	11.2431	[.000]
E29E36	.075695	.674087E-02	11.2292	[.000]
E29E37	.075586	.673049E-02	11.2304	[.000]
E29E38	.069181	.646655E-02	10.6983	[.000]
E29E39	.180789	.014299	12.6432	[.000]
E29E40	.071768	.645893E-02	11.1114	[.000]
E29E41	.069022	.645618E-02	10.6909	[.000]
E29E42	.180490	.014299	12.6221	[.000]
E29E43	.075254	.670434E-02	11.2246	[.000]
E29E44	.075239	.670329E-02	11.2242	[.000]

E30E1	.103109	.958095E-02	10.7618	[.000]
E30E2	.095128	.870873E-02	10.9232	[.000]
E30E3	.098036	.855671E-02	11.4572	[.000]
E30E4	.086294	.696612E-02	12.3877	[.000]
E30E5	.085702	.687333E-02	12.4688	[.000]
E30E6	.082019	.668675E-02	12.2659	[.000]
E30E7	.083655	.674794E-02	12.3971	[.000]
E30E8	.082577	.670372E-02	12.3181	[.000]
E30E9	.284542	.016946	16.7910	[.000]
E30E10	.293896	.017881	16.4364	[.000]
E30E11	.080191	.652374E-02	12.2922	[.000]
E30E12	.078482	.646919E-02	12.1317	[.000]
E30E13	.079674	.651437E-02	12.2304	[.000]
E30E14	.081075	.666856E-02	12.1578	[.000]
E30E15	.079714	.652769E-02	12.2118	[.000]
E30E16	.081299	.667176E-02	12.1856	[.000]
E30E17	.080441	.666173E-02	12.0752	[.000]
E30E18	.075801	.641806E-02	11.8106	[.000]
E30E19	.080594	.666209E-02	12.0974	[.000]
E30E20	.077690	.648564E-02	11.9787	[.000]
E30E21	.077860	.649562E-02	11.9866	[.000]
E30E22	.074262	.641801E-02	11.5708	[.000]
E30E23	.078789	.667066E-02	11.8113	[.000]
E30E24	.078713	.667245E-02	11.7968	[.000]
E30E25	.247323	.014457	17.1080	[.000]
E30E26	.071558	.647936E-02	11.0440	[.000]
E30E27	.076463	.651021E-02	11.7451	[.000]
E30E28	.074716	.644047E-02	11.6009	[.000]
E30E29	.075819	.648950E-02	11.6834	[.000]
E3030	-5.75841	.177457	-32.4496	[.000]
E30E31	.076092	.652122E-02	11.6683	[.000]
E30E32	.210505	.013723	15.3401	[.000]
E30E33	.187320	.014522	12.8991	[.000]
E30E34	.077842	.669132E-02	11.6332	[.000]
E30E35	.239574	.014138	16.9448	[.000]
E30E36	.077689	.669677E-02	11.6010	[.000]
E30E37	.077550	.670042E-02	11.5739	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E30E38	.075564	.653434E-02	11.5642	[.000]
E30E39	.077529	.670102E-02	11.5697	[.000]
E30E40	.072505	.644986E-02	11.2413	[.000]
E30E41	.075389	.653996E-02	11.5275	[.000]
E30E42	.077164	.671370E-02	11.4936	[.000]
E30E43	.077121	.671608E-02	11.4830	[.000]
E30E44	.077098	.671589E-02	11.4799	[.000]
E31E1	.093165	.872032E-02	10.6837	[.000]
E31E2	.089369	.798732E-02	11.1889	[.000]
E31E3	.090526	.804987E-02	11.2457	[.000]
E31E4	.047533	.013677	3.47546	[.001]
E31E5	.195918	.015264	12.8352	[.000]
E31E6	.082551	.686813E-02	12.0195	[.000]
E31E7	.083121	.701130E-02	11.8553	[.000]
E31E8	.082559	.699481E-02	11.8029	[.000]
E31E9	.080283	.673206E-02	11.9254	[.000]
E31E10	.079843	.670202E-02	11.9132	[.000]
E31E11	.078260	.662860E-02	11.8064	[.000]
E31E12	.077189	.660075E-02	11.6939	[.000]
E31E13	.053229	.010947	4.86247	[.000]
E31E14	.081764	.698703E-02	11.7023	[.000]
E31E15	.080178	.679324E-02	11.8027	[.000]

E31E16	.194090	.015230	12.7439	[.000]
E31E17	.081444	.699033E-02	11.6509	[.000]
E31E18	.078829	.673143E-02	11.7106	[.000]
E31E19	.081534	.699031E-02	11.6639	[.000]
E31E20	.062090	.834441E-02	7.44095	[.000]
E31E21	.078661	.675541E-02	11.6441	[.000]
E31E22	.075905	.667509E-02	11.3714	[.000]
E31E23	.080589	.701331E-02	11.4908	[.000]
E31E24	.080545	.701470E-02	11.4823	[.000]
E31E25	.077381	.675257E-02	11.4595	[.000]
E31E26	.077637	.676515E-02	11.4760	[.000]
E31E27	-.436660E-02	.030937	-.141147	[.888]
E31E28	.078718	.685634E-02	11.4811	[.000]
E31E29	.073717	.670057E-02	11.0016	[.000]
E31E30	.078058	.681660E-02	11.4512	[.000]
E3131	-3.25906	.202227	-16.1158	[.000]
E31E32	.076895	.675812E-02	11.3781	[.000]
E31E33	.080178	.703542E-02	11.3963	[.000]
E31E34	.080121	.703857E-02	11.3832	[.000]
E31E35	.078526	.688971E-02	11.3976	[.000]
E31E36	.080019	.704089E-02	11.3649	[.000]
E31E37	.079962	.704623E-02	11.3482	[.000]
E31E38	-.026478	.039087	-.677396	[.498]
E31E39	.079960	.704789E-02	11.3453	[.000]
E31E40	.075707	.674509E-02	11.2240	[.000]
E31E41	-.022549	.037586	-.599917	[.549]
E31E42	.079774	.705968E-02	11.2999	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E31E43	.191846	.015294	12.5439	[.000]
E31E44	.079730	.706068E-02	11.2921	[.000]
E32E1	.095989	.011341	8.46403	[.000]
E32E2	.091185	.010244	8.90174	[.000]
E32E3	.093113	.997889E-02	9.33102	[.000]
E32E4	.084358	.775518E-02	10.8776	[.000]
E32E5	.086211	.757906E-02	11.3749	[.000]
E32E6	.083207	.742109E-02	11.2123	[.000]
E32E7	.085006	.736492E-02	11.5420	[.000]
E32E8	.084367	.727867E-02	11.5909	[.000]
E32E9	.227118	.014727	15.4222	[.000]
E32E10	.235721	.014686	16.0503	[.000]
E32E11	.081215	.706813E-02	11.4904	[.000]
E32E12	.081521	.707185E-02	11.5275	[.000]
E32E13	.080584	.700670E-02	11.5009	[.000]
E32E14	.083507	.719540E-02	11.6056	[.000]
E32E15	.081948	.706603E-02	11.5974	[.000]
E32E16	.083693	.721110E-02	11.6062	[.000]
E32E17	.083155	.717342E-02	11.5922	[.000]
E32E18	.080095	.695706E-02	11.5128	[.000]
E32E19	.083244	.717825E-02	11.5967	[.000]
E32E20	.079412	.692657E-02	11.4648	[.000]
E32E21	.072689	.717425E-02	10.1319	[.000]
E32E22	.079541	.694094E-02	11.4596	[.000]
E32E23	.082217	.714852E-02	11.5013	[.000]
E32E24	.082158	.714717E-02	11.4951	[.000]
E32E25	.227966	.014605	15.6089	[.000]
E32E26	.079703	.695995E-02	11.4516	[.000]
E32E27	.078856	.692237E-02	11.3915	[.000]
E32E28	.079642	.696342E-02	11.4372	[.000]
E32E29	.078421	.691214E-02	11.3454	[.000]
E32E30	.223376	.014649	15.2487	[.000]

E32E31	.078677	.692758E-02	11.3571	[.000]
E3232	-4.82541	.162875	-29.6264	[.000]
E32E33	.198711	.015495	12.8241	[.000]
E32E34	.081695	.715796E-02	11.4131	[.000]
E32E35	.217803	.014749	14.7672	[.000]
E32E36	.081591	.715959E-02	11.3961	[.000]
E32E37	.081517	.716265E-02	11.3809	[.000]
E32E38	.078359	.693475E-02	11.2994	[.000]
E32E39	.081518	.716442E-02	11.3782	[.000]
E32E40	.078935	.696730E-02	11.3293	[.000]
E32E41	.078258	.693864E-02	11.2786	[.000]
E32E42	.081316	.717432E-02	11.3342	[.000]
E32E43	.081304	.717743E-02	11.3277	[.000]
E32E44	.081284	.717677E-02	11.3260	[.000]
E33E1	.090557	.011866	7.63172	[.000]
E33E2	.098061	.010768	9.10710	[.000]
E33E3	.090553	.010229	8.85222	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E33E4	.090768	.819404E-02	11.0774	[.000]
E33E5	.085866	.756749E-02	11.3467	[.000]
E33E6	.088737	.779436E-02	11.3848	[.000]
E33E7	.066175	.950661E-02	6.96091	[.000]
E33E8	.078190	.728087E-02	10.7391	[.000]
E33E9	.205621	.015848	12.9749	[.000]
E33E10	.205562	.015845	12.9734	[.000]
E33E11	.086823	.746191E-02	11.6354	[.000]
E33E12	.086635	.744145E-02	11.6423	[.000]
E33E13	.086232	.740102E-02	11.6514	[.000]
E33E14	.079349	.708104E-02	11.2058	[.000]
E33E15	.086051	.738558E-02	11.6512	[.000]
E33E16	.078003	.714859E-02	10.9117	[.000]
E33E17	.076874	.713656E-02	10.7718	[.000]
E33E18	.085127	.731080E-02	11.6440	[.000]
E33E19	.076606	.716840E-02	10.6866	[.000]
E33E20	.084916	.731550E-02	11.6076	[.000]
E33E21	.084601	.728265E-02	11.6168	[.000]
E33E22	.084188	.729171E-02	11.5457	[.000]
E33E23	.076340	.706123E-02	10.8112	[.000]
E33E24	.078293	.700180E-02	11.1818	[.000]
E33E25	.202319	.015750	12.8457	[.000]
E33E26	.083933	.729015E-02	11.5132	[.000]
E33E27	.083950	.729832E-02	11.5026	[.000]
E33E28	.083434	.725221E-02	11.5046	[.000]
E33E29	.083803	.729846E-02	11.4823	[.000]
E33E30	.202139	.015748	12.8356	[.000]
E33E31	.083672	.730055E-02	11.4611	[.000]
E33E32	.202178	.015740	12.8450	[.000]
E3333	-7.75390	.323810	-23.9458	[.000]
E33E34	.077146	.701212E-02	11.0018	[.000]
E33E35	.203646	.015653	13.0097	[.000]
E33E36	.076057	.704334E-02	10.7984	[.000]
E33E37	.076555	.702557E-02	10.8967	[.000]
E33E38	.083323	.730776E-02	11.4020	[.000]
E33E39	.077080	.701406E-02	10.9893	[.000]
E33E40	.083168	.730188E-02	11.3899	[.000]
E33E41	.083203	.731139E-02	11.3800	[.000]
E33E42	.076423	.703031E-02	10.8705	[.000]
E33E43	.078126	.701994E-02	11.1292	[.000]
E33E44	.063601	.881281E-02	7.21684	[.000]
E34E1	.100276	.013362	7.50448	[.000]

E34E2	.112460	.011623	9.67579	[.000]
E34E3	.107023	.011008	9.72234	[.000]
E34E4	.100100	.869571E-02	11.5114	[.000]
E34E5	.092498	.794664E-02	11.6399	[.000]
E34E6	.097034	.823622E-02	11.7814	[.000]
E34E7	.089534	.764816E-02	11.7067	[.000]
E34E8	.076172	.875322E-02	8.70215	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E34E9	.094068	.787335E-02	11.9477	[.000]
E34E10	.093973	.786419E-02	11.9495	[.000]
E34E11	.093547	.782804E-02	11.9502	[.000]
E34E12	.215182	.016505	13.0370	[.000]
E34E13	.213837	.016516	12.9476	[.000]
E34E14	.087210	.740847E-02	11.7717	[.000]
E34E15	.092239	.773090E-02	11.9313	[.000]
E34E16	.088741	.746680E-02	11.8847	[.000]
E34E17	.085741	.736016E-02	11.6493	[.000]
E34E18	.090944	.764776E-02	11.8915	[.000]
E34E19	.075528	.831012E-02	9.08865	[.000]
E34E20	.211684	.016480	12.8448	[.000]
E34E21	.090059	.760632E-02	11.8400	[.000]
E34E22	.211176	.016445	12.8417	[.000]
E34E23	.083800	.730294E-02	11.4748	[.000]
E34E24	.082730	.730561E-02	11.3241	[.000]
E34E25	.088671	.759272E-02	11.6784	[.000]
E34E26	.088817	.760394E-02	11.6805	[.000]
E34E27	.088801	.761201E-02	11.6659	[.000]
E34E28	.088267	.756774E-02	11.6635	[.000]
E34E29	.088550	.760942E-02	11.6369	[.000]
E34E30	.088287	.758961E-02	11.6327	[.000]
E34E31	.088341	.761151E-02	11.6063	[.000]
E34E32	.088021	.758503E-02	11.6046	[.000]
E34E33	.081581	.730682E-02	11.1650	[.000]
E3434	-10.5052	.554466	-18.9466	[.000]
E34E35	.087555	.757451E-02	11.5592	[.000]
E34E36	.082417	.729978E-02	11.2904	[.000]
E34E37	.066327	.945862E-02	7.01238	[.000]
E34E38	.087762	.761581E-02	11.5237	[.000]
E34E39	-.029925	.043358	-.690184	[.490]
E34E40	.087565	.761040E-02	11.5060	[.000]
E34E41	.087564	.761862E-02	11.4934	[.000]
E34E42	.019684	.024749	.795333	[.426]
E34E43	.071615	.824029E-02	8.69082	[.000]
E34E44	.081167	.731112E-02	11.1018	[.000]
E35E1	.119351	.012551	9.50965	[.000]
E35E2	.106072	.011493	9.22907	[.000]
E35E3	.113922	.011050	10.3096	[.000]
E35E4	.102219	.871921E-02	11.7234	[.000]
E35E5	.100771	.841804E-02	11.9709	[.000]
E35E6	.092923	.831735E-02	11.1721	[.000]
E35E7	.098533	.818660E-02	12.0359	[.000]
E35E8	.097405	.809985E-02	12.0255	[.000]
E35E9	.292724	.017007	17.2120	[.000]
E35E10	.282552	.016649	16.9706	[.000]
E35E11	.096070	.798807E-02	12.0266	[.000]
E35E12	.094643	.790062E-02	11.9792	[.000]
E35E13	.095168	.793161E-02	11.9986	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E35E14	.095794	.801364E-02	11.9538	[.000]

E35E15	.095238	.794457E-02	11.9878	[.000]
E35E16	.096010	.802118E-02	11.9695	[.000]
E35E17	.095112	.798972E-02	11.9043	[.000]
E35E18	.089489	.772668E-02	11.5818	[.000]
E35E19	.095283	.799487E-02	11.9181	[.000]
E35E20	.093104	.785458E-02	11.8534	[.000]
E35E21	.092413	.780745E-02	11.8365	[.000]
E35E22	.090665	.775606E-02	11.6896	[.000]
E35E23	.093348	.796782E-02	11.7156	[.000]
E35E24	.093280	.796993E-02	11.7040	[.000]
E35E25	.275305	.016499	16.6861	[.000]
E35E26	.090177	.775222E-02	11.6324	[.000]
E35E27	.091660	.785113E-02	11.6747	[.000]
E35E28	.083240	.785473E-02	10.5974	[.000]
E35E29	.091340	.784571E-02	11.6420	[.000]
E35E30	.286019	.016861	16.9630	[.000]
E35E31	.091240	.785729E-02	11.6122	[.000]
E35E32	.244860	.016481	14.8570	[.000]
E35E33	.225154	.017221	13.0746	[.000]
E35E34	.092350	.798068E-02	11.5716	[.000]
E3535	-8.99642	.303285	-29.6632	[.000]
E35E36	.092174	.798394E-02	11.5449	[.000]
E35E37	.092037	.798804E-02	11.5218	[.000]
E35E38	.090691	.786794E-02	11.5266	[.000]
E35E39	.092016	.798873E-02	11.5182	[.000]
E35E40	.088940	.776895E-02	11.4482	[.000]
E35E41	.090505	.787294E-02	11.4957	[.000]
E35E42	.091624	.800002E-02	11.4529	[.000]
E35E43	.091586	.800319E-02	11.4436	[.000]
E35E44	.091528	.799962E-02	11.4415	[.000]
E36E1	.086212	.016935	5.09088	[.000]
E36E2	.093869	.015338	6.12005	[.000]
E36E3	.075607	.015035	5.02881	[.000]
E36E4	.092479	.010498	8.80935	[.000]
E36E5	.089780	.941374E-02	9.53710	[.000]
E36E6	.225775	.018079	12.4883	[.000]
E36E7	.082359	.877106E-02	9.38983	[.000]
E36E8	.082425	.850780E-02	9.68811	[.000]
E36E9	.091461	.891729E-02	10.2566	[.000]
E36E10	.091444	.889922E-02	10.2755	[.000]
E36E11	.091565	.880033E-02	10.4047	[.000]
E36E12	.091465	.875566E-02	10.4463	[.000]
E36E13	.091418	.862430E-02	10.6000	[.000]
E36E14	.057507	.013283	4.32935	[.000]
E36E15	.091414	.857471E-02	10.6609	[.000]
E36E16	.085443	.818998E-02	10.4326	[.000]
E36E17	.048511	.016060	3.02063	[.003]
E36E18	.222979	.017531	12.7193	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E36E19	.081560	.817777E-02	9.97344	[.000]
E36E20	.091110	.832682E-02	10.9417	[.000]
E36E21	.090726	.828601E-02	10.9493	[.000]
E36E22	.090893	.822225E-02	11.0545	[.000]
E36E23	.020359	.025796	.789216	[.430]
E36E24	.410263	.029555	13.8815	[.000]
E36E25	.090694	.817690E-02	11.0915	[.000]
E36E26	.090844	.819515E-02	11.0851	[.000]
E36E27	.090884	.819528E-02	11.0899	[.000]
E36E28	.224421	.017336	12.9455	[.000]
E36E29	.090853	.818271E-02	11.1030	[.000]

E36E30	.090655	.815865E-02	11.1116	[.000]
E36E31	.090820	.817189E-02	11.1137	[.000]
E36E32	.090551	.814095E-02	11.1229	[.000]
E36E33	.082683	.785523E-02	10.5259	[.000]
E36E34	.084965	.781661E-02	10.8698	[.000]
E36E35	.090380	.811573E-02	11.1364	[.000]
E3636	-6.29707	.279772	-22.5079	[.000]
E36E37	.295606	.017524	16.8685	[.000]
E36E38	.090738	.815170E-02	11.1312	[.000]
E36E39	.085076	.780795E-02	10.8961	[.000]
E36E40	.090656	.814160E-02	11.1349	[.000]
E36E41	.090710	.814717E-02	11.1339	[.000]
E36E42	.085002	.780145E-02	10.8956	[.000]
E36E43	.086639	.784028E-02	11.0505	[.000]
E36E44	.077755	.821687E-02	9.46285	[.000]
E37E1	.095916	.017836	5.37771	[.000]
E37E2	.116138	.015038	7.72279	[.000]
E37E3	.109558	.014185	7.72345	[.000]
E37E4	.106870	.010577	10.1044	[.000]
E37E5	.100579	.951535E-02	10.5701	[.000]
E37E6	.245822	.019040	12.9108	[.000]
E37E7	.096278	.896540E-02	10.7389	[.000]
E37E8	.064113	.014813	4.32814	[.000]
E37E9	.102220	.918584E-02	11.1280	[.000]
E37E10	.102143	.916972E-02	11.1392	[.000]
E37E11	.101885	.908824E-02	11.2107	[.000]
E37E12	.101684	.905179E-02	11.2336	[.000]
E37E13	.101151	.894298E-02	11.3107	[.000]
E37E14	.093911	.849508E-02	11.0548	[.000]
E37E15	.100901	.889866E-02	11.3389	[.000]
E37E16	.096736	.857671E-02	11.2789	[.000]
E37E17	.092240	.842980E-02	10.9421	[.000]
E37E18	.238923	.018542	12.8854	[.000]
E37E19	.066658	.013335	4.99865	[.000]
E37E20	.099491	.870240E-02	11.4325	[.000]
E37E21	.099094	.866117E-02	11.4412	[.000]
E37E22	.098599	.862198E-02	11.4358	[.000]
E37E23	.090594	.829005E-02	10.9281	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E37E24	.335821	.019973	16.8140	[.000]
E37E25	.098112	.858616E-02	11.4268	[.000]
E37E26	.098270	.860115E-02	11.4252	[.000]
E37E27	.098275	.860581E-02	11.4197	[.000]
E37E28	.238854	.018342	13.0223	[.000]
E37E29	.098083	.859592E-02	11.4104	[.000]
E37E30	.097823	.857202E-02	11.4119	[.000]
E37E31	.097926	.859096E-02	11.3987	[.000]
E37E32	.097588	.855885E-02	11.4020	[.000]
E37E33	.089938	.825308E-02	10.8976	[.000]
E37E34	.073696	.010634	6.93031	[.000]
E37E35	.097202	.853919E-02	11.3831	[.000]
E37E36	.313879	.018517	16.9510	[.000]
E3737	-3.48860	.176210	-19.7980	[.000]
E37E38	.097485	.858035E-02	11.3614	[.000]
E37E39	.075143	.010227	7.34735	[.000]
E37E40	.097316	.857169E-02	11.3532	[.000]
E37E41	.097334	.857886E-02	11.3458	[.000]
E37E42	.076621	.983452E-02	7.79107	[.000]
E37E43	.086986	.834586E-02	10.4226	[.000]
E37E44	.089013	.824900E-02	10.7908	[.000]

E38E1	.109833	.014571	7.53791	[.000]
E38E2	.105620	.013040	8.09971	[.000]
E38E3	.107187	.012755	8.40328	[.000]
E38E4	.771210	.080610	9.56718	[.000]
E38E5	.100881	.938281E-02	10.7516	[.000]
E38E6	.098812	.920943E-02	10.7295	[.000]
E38E7	.099770	.904187E-02	11.0342	[.000]
E38E8	.099206	.889819E-02	11.1490	[.000]
E38E9	.096360	.866809E-02	11.1167	[.000]
E38E10	.095820	.862345E-02	11.1116	[.000]
E38E11	.093848	.847210E-02	11.0774	[.000]
E38E12	.092685	.842419E-02	11.0023	[.000]
E38E13	.058608	.015053	3.89341	[.000]
E38E14	.098407	.873925E-02	11.2604	[.000]
E38E15	.256288	.017580	14.5787	[.000]
E38E16	.098556	.876322E-02	11.2465	[.000]
E38E17	.098087	.869015E-02	11.2871	[.000]
E38E18	.094904	.839195E-02	11.3089	[.000]
E38E19	.098179	.870303E-02	11.2810	[.000]
E38E20	.072492	.010770	6.73073	[.000]
E38E21	.094767	.836545E-02	11.3284	[.000]
E38E22	.091495	.820375E-02	11.1529	[.000]
E38E23	.097230	.860437E-02	11.3001	[.000]
E38E24	.097185	.860152E-02	11.2986	[.000]
E38E25	.093363	.827452E-02	11.2832	[.000]
E38E26	.093629	.828931E-02	11.2951	[.000]
E38E27	-.063607	.059269	-1.07319	[.283]
E38E28	.095007	.839225E-02	11.3208	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E38E29	.088665	.820457E-02	10.8067	[.000]
E38E30	.094203	.833407E-02	11.3033	[.000]
E38E31	-.032071	.047321	-.677736	[.498]
E38E32	.092803	.825423E-02	11.2431	[.000]
E38E33	.096822	.858892E-02	11.2729	[.000]
E38E34	.096765	.858785E-02	11.2677	[.000]
E38E35	.094840	.840136E-02	11.2887	[.000]
E38E36	.096659	.858410E-02	11.2603	[.000]
E38E37	.096604	.858521E-02	11.2523	[.000]
E3838	-11.5791	.429665	-26.9491	[.000]
E38E39	.096604	.858641E-02	11.2508	[.000]
E38E40	.282010	.017321	16.2812	[.000]
E38E41	2.34834	.335150	7.00685	[.000]
E38E42	.096417	.858777E-02	11.2272	[.000]
E38E43	.096406	.858979E-02	11.2233	[.000]
E38E44	.096372	.858697E-02	11.2230	[.000]
E39E1	.096864	.012877	7.52241	[.000]
E39E2	.111802	.011356	9.84545	[.000]
E39E3	.106696	.010782	9.89560	[.000]
E39E4	.104899	.916257E-02	11.4487	[.000]
E39E5	.097894	.852025E-02	11.4895	[.000]
E39E6	.102892	.883737E-02	11.6428	[.000]
E39E7	.096062	.833984E-02	11.5185	[.000]
E39E8	.082802	.943876E-02	8.77256	[.000]
E39E9	.101328	.863671E-02	11.7323	[.000]
E39E10	.101267	.863113E-02	11.7328	[.000]
E39E11	.101122	.862441E-02	11.7251	[.000]
E39E12	.100962	.861126E-02	11.7244	[.000]
E39E13	.100577	.859076E-02	11.7075	[.000]
E39E14	.095075	.823133E-02	11.5504	[.000]
E39E15	.100374	.858037E-02	11.6981	[.000]

E39E16	.096598	.828701E-02	11.6565	[.000]
E39E17	.093847	.820563E-02	11.4369	[.000]
E39E18	.099499	.853177E-02	11.6622	[.000]
E39E19	.083119	.909434E-02	9.13964	[.000]
E39E20	.099320	.855531E-02	11.6092	[.000]
E39E21	.098935	.851437E-02	11.6197	[.000]
E39E22	.098627	.855338E-02	11.5308	[.000]
E39E23	.092704	.820706E-02	11.2956	[.000]
E39E24	.091583	.820875E-02	11.1568	[.000]
E39E25	.098228	.854627E-02	11.4937	[.000]
E39E26	.098369	.855785E-02	11.4946	[.000]
E39E27	.235587	.018580	12.6799	[.000]
E39E28	.097866	.852205E-02	11.4839	[.000]
E39E29	.235639	.018577	12.6846	[.000]
E39E30	.097997	.855141E-02	11.4597	[.000]
E39E31	.098141	.857973E-02	11.4387	[.000]
E39E32	.097817	.855107E-02	11.4392	[.000]
E39E33	.090732	.823106E-02	11.0231	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E39E34	-.035175	.049064	-.716907	[.473]
E39E35	.097480	.854600E-02	11.4065	[.000]
E39E36	.091845	.823391E-02	11.1545	[.000]
E39E37	.075280	.010274	7.32723	[.000]
E39E38	.097808	.859604E-02	11.3782	[.000]
E3939	-11.4604	.476406	-24.0559	[.000]
E39E40	.097658	.859215E-02	11.3659	[.000]
E39E41	.097694	.860263E-02	11.3563	[.000]
E39E42	.984932	.115769	8.50774	[.000]
E39E43	.078662	.951912E-02	8.26358	[.000]
E39E44	.090813	.825640E-02	10.9992	[.000]
E40E1	.102965	.012203	8.43770	[.000]
E40E2	.098399	.011118	8.85075	[.000]
E40E3	.102428	.010985	9.32474	[.000]
E40E4	.297394	.018147	16.3883	[.000]
E40E5	.101205	.906011E-02	11.1704	[.000]
E40E6	.097648	.882613E-02	11.0635	[.000]
E40E7	.100931	.892519E-02	11.3085	[.000]
E40E8	.100827	.888291E-02	11.3506	[.000]
E40E9	.091398	.865237E-02	10.5634	[.000]
E40E10	.091530	.864166E-02	10.5917	[.000]
E40E11	.096599	.858327E-02	11.2543	[.000]
E40E12	.074656	.011393	6.55265	[.000]
E40E13	.095286	.852552E-02	11.1766	[.000]
E40E14	.100662	.885205E-02	11.3716	[.000]
E40E15	.266056	.018283	14.5518	[.000]
E40E16	.100689	.885468E-02	11.3713	[.000]
E40E17	.100595	.884989E-02	11.3668	[.000]
E40E18	.094132	.850102E-02	11.0730	[.000]
E40E19	.100619	.885064E-02	11.3686	[.000]
E40E20	.095039	.851039E-02	11.1674	[.000]
E40E21	.097825	.862242E-02	11.3454	[.000]
E40E22	.052303	.018028	2.90116	[.004]
E40E23	.100423	.887426E-02	11.3162	[.000]
E40E24	.100421	.887716E-02	11.3123	[.000]
E40E25	.090082	.864988E-02	10.4142	[.000]
E40E26	.092442	.854417E-02	10.8193	[.000]
E40E27	.095081	.854133E-02	11.1319	[.000]
E40E28	.096886	.860989E-02	11.2529	[.000]
E40E29	.095372	.855532E-02	11.1477	[.000]
E40E30	.093664	.853802E-02	10.9702	[.000]

E40E31	.095096	.855634E-02	11.1141	[.000]
E40E32	.096991	.863048E-02	11.2382	[.000]
E40E33	.100339	.890278E-02	11.2705	[.000]
E40E34	.100343	.890900E-02	11.2631	[.000]
E40E35	.096649	.862701E-02	11.2031	[.000]
E40E36	.100309	.891410E-02	11.2529	[.000]
E40E37	.100307	.892141E-02	11.2434	[.000]
E40E38	.295115	.018178	16.2348	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value
E40E39	.100311	.892304E-02	11.2418	[.000]
E4040	-15.4677	.631441	-24.4959	[.000]
E40E41	.295127	.018186	16.2279	[.000]
E40E42	.100272	.894100E-02	11.2149	[.000]
E40E43	.100280	.894492E-02	11.2108	[.000]
E40E44	.100247	.894239E-02	11.2103	[.000]
E41E1	.114051	.012415	9.18626	[.000]
E41E2	.110070	.011282	9.75631	[.000]
E41E3	.111990	.011278	9.92994	[.000]
E41E4	.839368	.088338	9.50182	[.000]
E41E5	.107112	.944993E-02	11.3347	[.000]
E41E6	.104823	.919413E-02	11.4011	[.000]
E41E7	.106230	.930309E-02	11.4188	[.000]
E41E8	.105790	.925088E-02	11.4356	[.000]
E41E9	.102618	.892246E-02	11.5011	[.000]
E41E10	.102046	.887940E-02	11.4924	[.000]
E41E11	.099992	.876216E-02	11.4118	[.000]
E41E12	.098776	.872507E-02	11.3209	[.000]
E41E13	.061593	.016229	3.79524	[.000]
E41E14	.105165	.920331E-02	11.4268	[.000]
E41E15	.275332	.018829	14.6229	[.000]
E41E16	.105289	.921227E-02	11.4292	[.000]
E41E17	.104917	.919408E-02	11.4113	[.000]
E41E18	.101467	.885559E-02	11.4580	[.000]
E41E19	.104991	.919732E-02	11.4154	[.000]
E41E20	.077187	.011544	6.68622	[.000]
E41E21	.101426	.887289E-02	11.4310	[.000]
E41E22	.098044	.874875E-02	11.2066	[.000]
E41E23	.104250	.919413E-02	11.3388	[.000]
E41E24	.104214	.919469E-02	11.3342	[.000]
E41E25	.100124	.884627E-02	11.3182	[.000]
E41E26	.100400	.886050E-02	11.3312	[.000]
E41E27	-.077949	.067226	-1.15951	[.246]
E41E28	.101920	.898138E-02	11.3479	[.000]
E41E29	.095070	.878004E-02	10.8280	[.000]
E41E30	.101077	.892475E-02	11.3255	[.000]
E41E31	-.029777	.049023	-.607414	[.544]
E41E32	.099597	.884507E-02	11.2602	[.000]
E41E33	.103939	.921114E-02	11.2841	[.000]
E41E34	.103895	.921379E-02	11.2761	[.000]
E41E35	.101843	.901596E-02	11.2958	[.000]
E41E36	.103806	.921493E-02	11.2650	[.000]
E41E37	.103767	.922026E-02	11.2542	[.000]
E41E38	2.53126	.361278	7.00642	[.000]
E41E39	.103770	.922217E-02	11.2523	[.000]
E41E40	.303685	.018657	16.2774	[.000]
E4141	-9.18411	.427344	-21.4911	[.000]
E41E42	.103625	.923357E-02	11.2227	[.000]
E41E43	.103621	.923695E-02	11.2181	[.000]

Parameter	Estimate	Standard Error	t-statistic	P-value

E41E44	.103587	.923428E-02	11.2176	[.000]
E42E1	.100935	.014260	7.07826	[.000]
E42E2	.121594	.012408	9.79958	[.000]
E42E3	.116133	.011801	9.84113	[.000]
E42E4	.118204	.010460	11.3005	[.000]
E42E5	.110874	.981150E-02	11.3004	[.000]
E42E6	.116811	.010181	11.4734	[.000]
E42E7	.109465	.968075E-02	11.3075	[.000]
E42E8	.094421	.011064	8.53443	[.000]
E42E9	.116168	.010055	11.5538	[.000]
E42E10	.116129	.010051	11.5545	[.000]
E42E11	.116186	.010061	11.5486	[.000]
E42E12	.116068	.010050	11.5489	[.000]
E42E13	.115908	.010047	11.5371	[.000]
E42E14	.109696	.963756E-02	11.3821	[.000]
E42E15	.115796	.010043	11.5305	[.000]
E42E16	.111257	.969059E-02	11.4809	[.000]
E42E17	.108453	.962259E-02	11.2707	[.000]
E42E18	.115154	.010008	11.5063	[.000]
E42E19	.095640	.010702	8.93676	[.000]
E42E20	.115239	.010051	11.4651	[.000]
E42E21	.114787	.010003	11.4752	[.000]
E42E22	.114826	.010066	11.4069	[.000]
E42E23	.107838	.965795E-02	11.1657	[.000]
E42E24	.106771	.966024E-02	11.0526	[.000]
E42E25	.114527	.010064	11.3797	[.000]
E42E26	.114678	.010077	11.3797	[.000]
E42E27	.276690	.021923	12.6208	[.000]
E42E28	.114161	.010037	11.3736	[.000]
E42E29	.276836	.021921	12.6285	[.000]
E42E30	.114390	.010075	11.3543	[.000]
E42E31	.114620	.010110	11.3371	[.000]
E42E32	.114266	.010077	11.3390	[.000]
E42E33	.105351	.971034E-02	10.8493	[.000]
E42E34	.024168	.033046	.731326	[.465]
E42E35	.113987	.010074	11.3151	[.000]
E42E36	.107325	.970538E-02	11.0583	[.000]
E42E37	.089984	.011649	7.72486	[.000]
E42E38	.114442	.010135	11.2915	[.000]
E42E39	1.16199	.136667	8.50233	[.000]
E42E40	.114311	.010132	11.2827	[.000]
E42E41	.114381	.010145	11.2749	[.000]
E4242	-13.1457	.490940	-26.7767	[.000]
E42E43	.091403	.011350	8.05345	[.000]
E42E44	.106056	.974019E-02	10.8885	[.000]
E43E1	.122345	.013973	8.75551	[.000]
E43E2	.131272	.013031	10.0736	[.000]
E43E3	.126637	.012457	10.1659	[.000]
E43E4	.124743	.010809	11.5411	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E43E5	.378958	.022208	17.0637	[.000]
E43E6	.122704	.010494	11.6927	[.000]
E43E7	.116277	.010006	11.6206	[.000]
E43E8	.109819	.010029	10.9500	[.000]
E43E9	.121262	.010329	11.7396	[.000]
E43E10	.121200	.010324	11.7391	[.000]
E43E11	.121104	.010328	11.7257	[.000]
E43E12	.120948	.010317	11.7227	[.000]
E43E13	.120595	.010308	11.6990	[.000]
E43E14	.115641	.995418E-02	11.6173	[.000]

E43E15	.120378	.010300	11.6875	[.000]
E43E16	.322295	.021221	15.1875	[.000]
E43E17	.114603	.992533E-02	11.5465	[.000]
E43E18	.119502	.010263	11.6436	[.000]
E43E19	.109150	.995284E-02	10.9667	[.000]
E43E20	.119388	.010302	11.5883	[.000]
E43E21	.118945	.010256	11.5976	[.000]
E43E22	.118705	.010315	11.5081	[.000]
E43E23	.113550	.995154E-02	11.4103	[.000]
E43E24	.112872	.993395E-02	11.3623	[.000]
E43E25	.118294	.010313	11.4708	[.000]
E43E26	.118442	.010324	11.4722	[.000]
E43E27	.118514	.010341	11.4606	[.000]
E43E28	.117892	.010287	11.4606	[.000]
E43E29	.118354	.010346	11.4395	[.000]
E43E30	.118053	.010321	11.4376	[.000]
E43E31	.283991	.022602	12.5647	[.000]
E43E32	.117888	.010326	11.4171	[.000]
E43E33	.111193	.994022E-02	11.1862	[.000]
E43E34	.096675	.011239	8.60179	[.000]
E43E35	.117516	.010321	11.3856	[.000]
E43E36	.112788	.999439E-02	11.2851	[.000]
E43E37	.105558	.010113	10.4375	[.000]
E43E38	.117942	.010384	11.3583	[.000]
E43E39	.095093	.011506	8.26480	[.000]
E43E40	.117774	.010380	11.3465	[.000]
E43E41	.117832	.010393	11.3371	[.000]
E43E42	.094228	.011644	8.09270	[.000]
E4343	-11.7905	.514694	-22.9077	[.000]
E43E44	.111601	.010002	11.1578	[.000]
E44E1	.369161	.028441	12.9800	[.000]
E44E2	.072123	.018108	3.98295	[.000]
E44E3	.394457	.028244	13.9662	[.000]
E44E4	.093114	.012824	7.26064	[.000]
E44E5	.094383	.011650	8.10124	[.000]
E44E6	.096688	.011962	8.08318	[.000]
E44E7	.062706	.016323	3.84163	[.000]
E44E8	.393315	.023870	16.4771	[.000]
E44E9	.102222	.011205	9.12260	[.000]
Parameter	Estimate	Standard Error	t-statistic	P-value
E44E10	.102358	.011188	9.14875	[.000]
E44E11	.103613	.011098	9.33588	[.000]
E44E12	.103827	.011053	9.39366	[.000]
E44E13	.105182	.010931	9.62225	[.000]
E44E14	.410903	.025101	16.3698	[.000]
E44E15	.105766	.010885	9.71681	[.000]
E44E16	.093962	.010611	8.85559	[.000]
E44E17	.481148	.032569	14.7730	[.000]
E44E18	.107044	.010705	9.99965	[.000]
E44E19	.402908	.024369	16.5338	[.000]
E44E20	.108682	.010662	10.1931	[.000]
E44E21	.108212	.010615	10.1942	[.000]
E44E22	.110329	.010573	10.4350	[.000]
E44E23	.459052	.029699	15.4570	[.000]
E44E24	.099618	.010249	9.72009	[.000]
E44E25	.110900	.010532	10.5293	[.000]
E44E26	.111013	.010553	10.5193	[.000]
E44E27	.111262	.010559	10.5370	[.000]
E44E28	.110815	.010490	10.5636	[.000]
E44E29	.111637	.010551	10.5809	[.000]

E44E30	.111490	.010520	10.5976	[.000]
E44E31	.112003	.010545	10.6216	[.000]
E44E32	.111793	.010510	10.6370	[.000]
E44E33	.084316	.012720	6.62848	[.000]
E44E34	.104014	.010124	10.2735	[.000]
E44E35	.112119	.010482	10.6966	[.000]
E44E36	.095910	.010693	8.96972	[.000]
E44E37	.102994	.010151	10.1462	[.000]
E44E38	.112932	.010537	10.7181	[.000]
E44E39	.104815	.010117	10.3605	[.000]
E44E40	.113039	.010525	10.7396	[.000]
E44E41	.113249	.010536	10.7486	[.000]
E44E42	.105151	.010118	10.3923	[.000]
E44E43	.107651	.010135	10.6220	[.000]
E4444	-14.8235	1.06935	-13.8621	[.000]

APPENDIX C

SECTION 2 UNCOMPENSATED DEMAND ELASTICITY BAR CHARTS FOR ALL 22 MODEL SPECIFICATIONS

Below are 42 figures (44 minus the two products reported in the main text) that contain visual information regarding bottled juice substitution patterns. Each figure is a bar chart where each block of bars consists of results over all 22 model specifications. Each group of bars represents the same elasticity as estimated by different specifications regarding demand. Product numbers are along the x-axis and elasticity values are along the y-axis. For convenience, the table below provides the list of products with their corresponding numbers.

Table C-1 Bottled Juice Names and Numbers

1	Dom. Apple Juice	23	Minute Maid Apple Juice
2	OS Cranberry Juice Cocktail	24	OS Grapefruit Juice
3	Mott's Regular Apple Juice	25	OS Crancherry Drink
4	Gatorade Lemon-Lime	26	HI-C Orange
5	Welch's White Grape	27	Gatorade Watermelon
6	OS Ruby Red	28	Dom. Ruby Red Grapefruit
7	Dom. Cranberry Juice	29	Gatorade Blue Raspberry
8	Musselman Apple Juice	30	OS Crangrape Drink
9	OS Cranapple Drink	31	Gatorade Grape
10	OS Cranraspberry Drink	32	OS Low Calorie Cranraspberry
11	Gatorade Orange	33	Dom. Cranraspberry Drink
12	Hawaiian Punch	34	Libby Punch
13	Gatorade Fruit Punch	35	Dom. Cranapple Drink
14	Indian Summer Apple Juice	36	OS Pink Grapefruit
15	Gatorade Lemon-Ice Punch	37	Dom. Reg. Grapefruit
16	Welch's Regular Grape	38	Gatorade Lemonade
17	Mott's Natural Apple Juice	39	Libby Berry
18	OS Ruby Red & Tangerine	40	HI-C Ecto Cooler
19	Treetop Apple Juice	41	Gatorade Brand Citrus
20	Gatorade Tropical Burst	42	Libby Cherry
21	OS Low Calorie Cranberry	43	Libby Grape
22	HI-C Fruit Punch	44	Veryfine Apple Juice

FIGURE C-1

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 2 (OCEAN SPRAY CRANBERRY JUICE) OVER ALL 22 MODEL SPECIFICATIONS

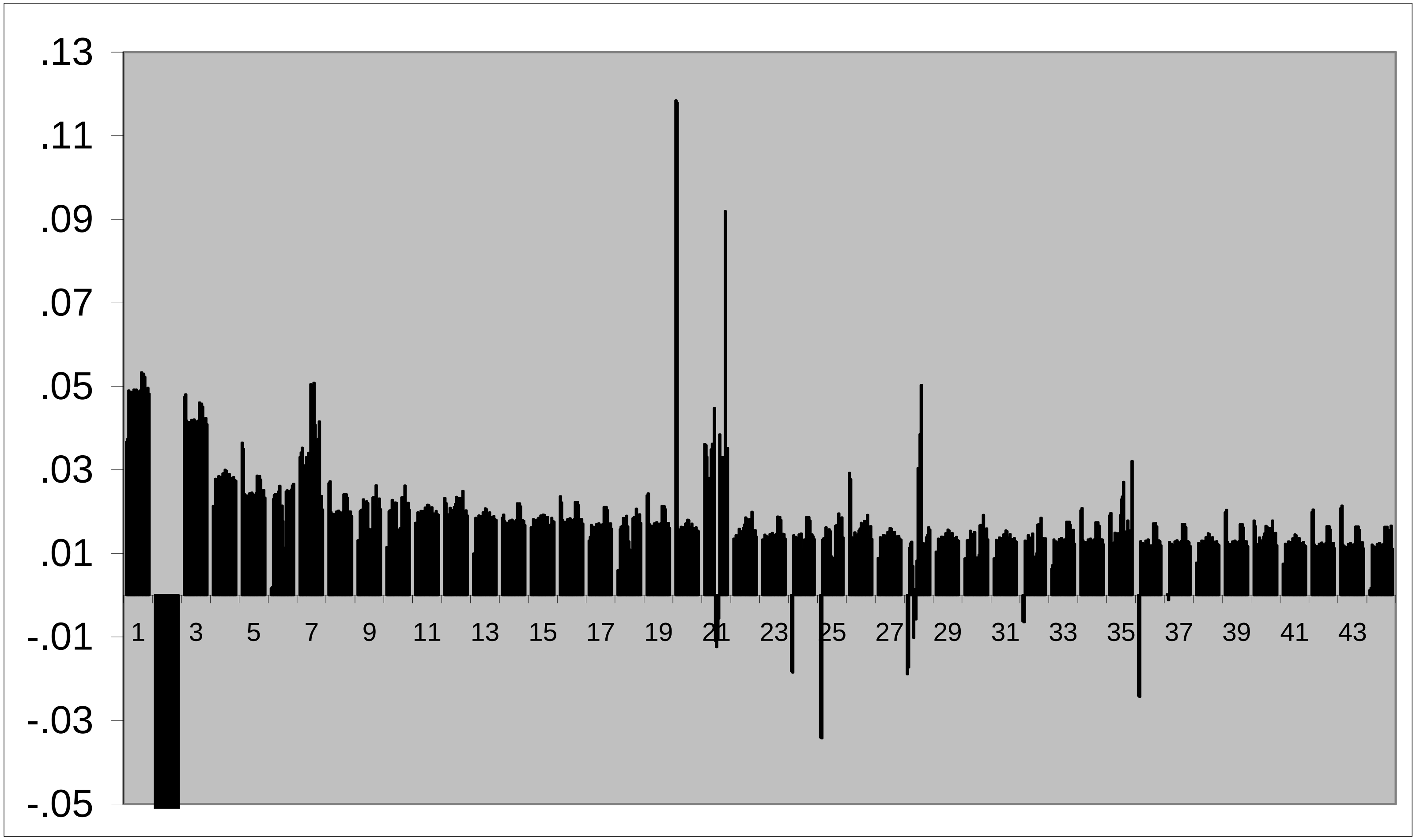


FIGURE C-2

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 3 (MOTT'S REGULAR APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

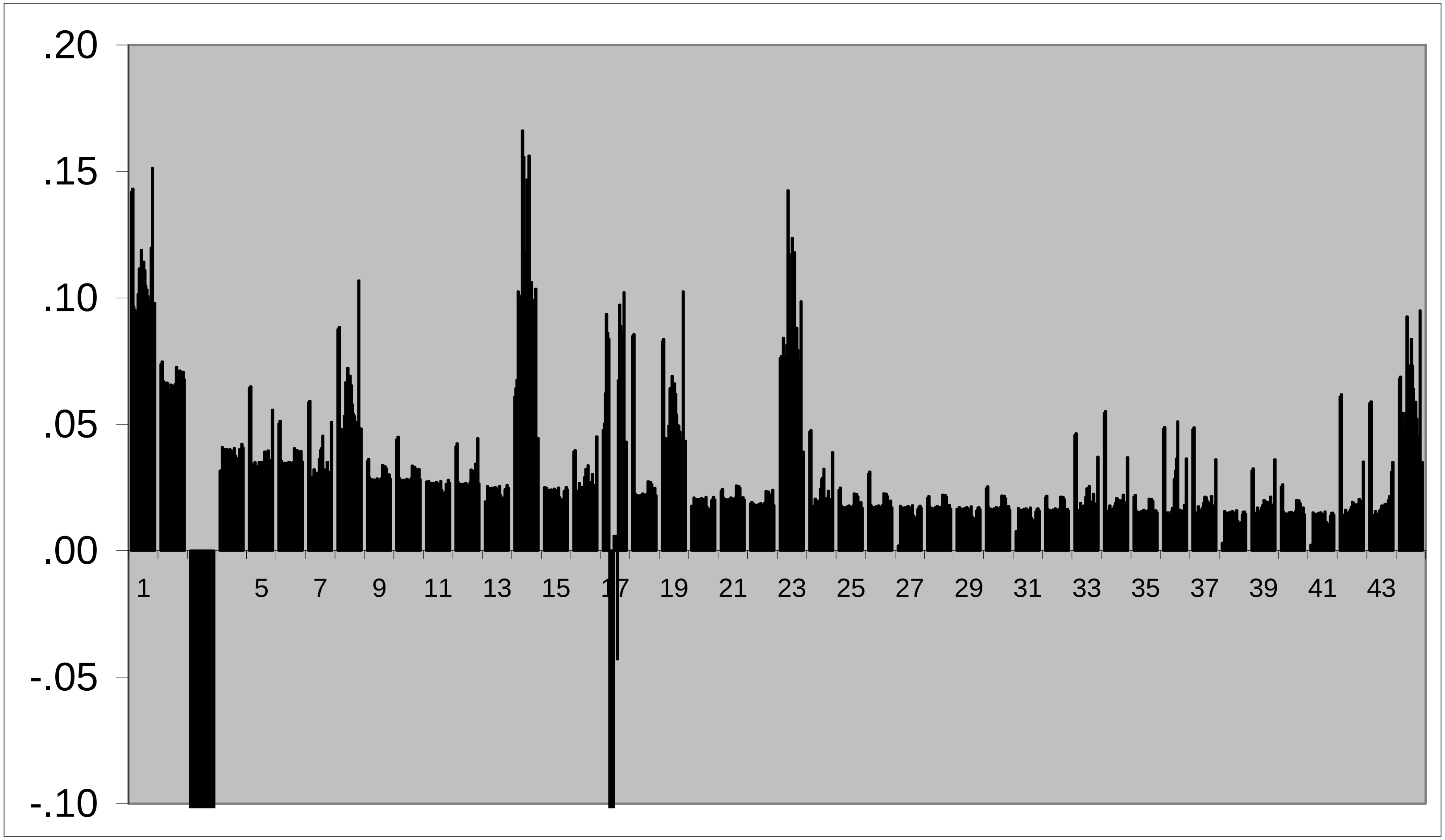


FIGURE C-3

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 4 (GATORADE LEMON-LIME) OVER ALL 22 MODEL SPECIFICATIONS

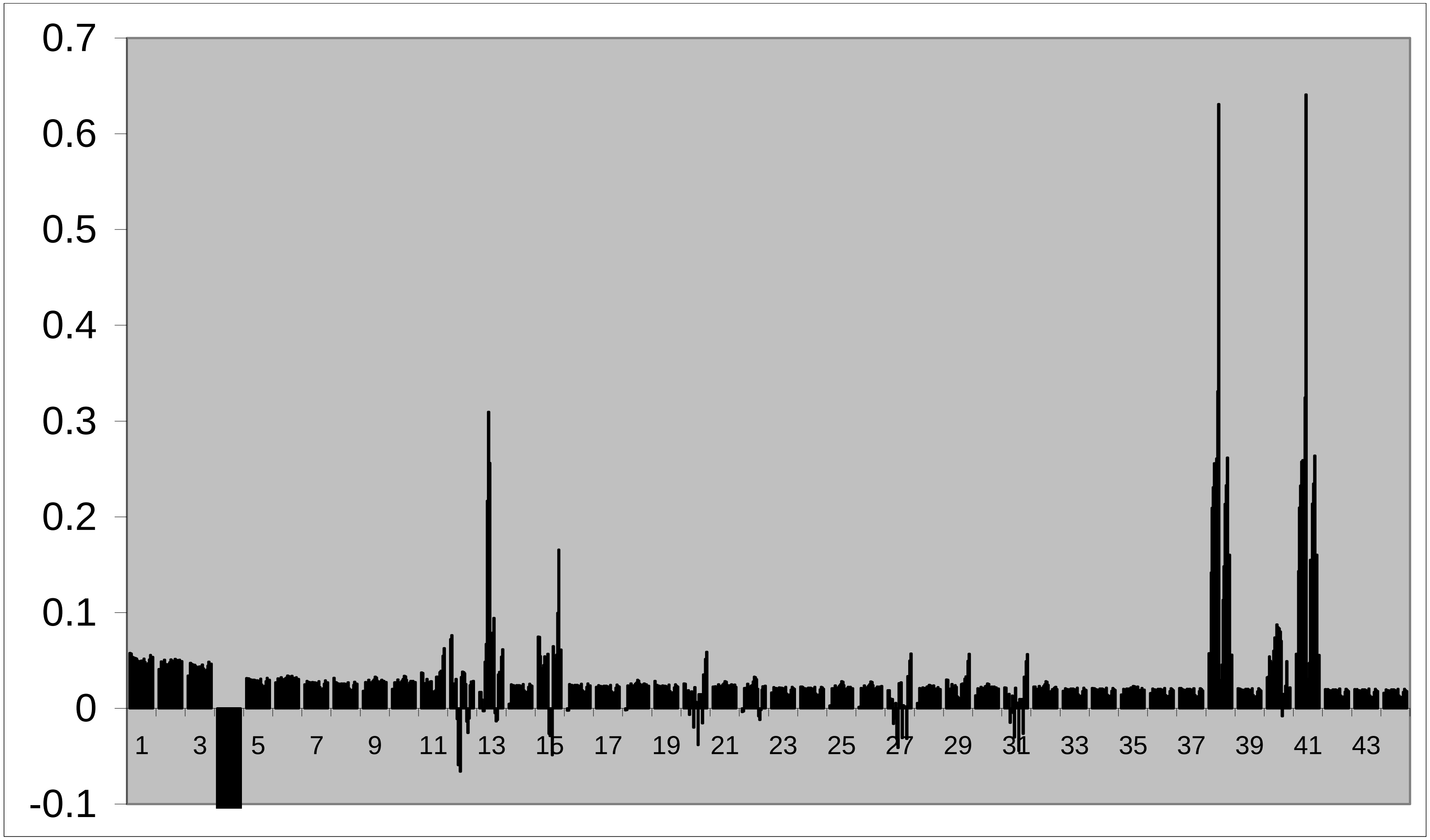


FIGURE C-4

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 5 (WELCH'S WHITE GRAPE) OVER ALL 22 MODEL SPECIFICATIONS

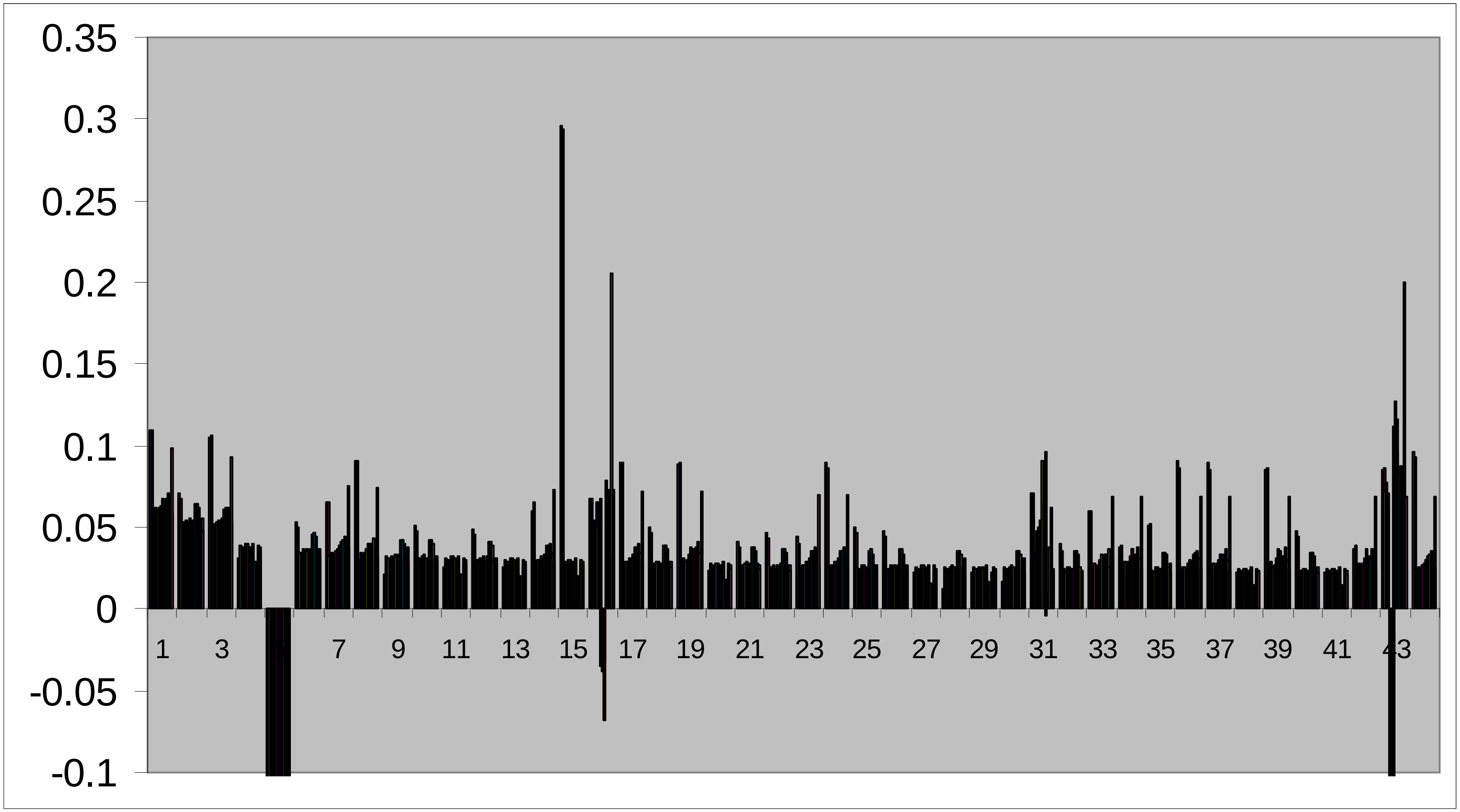


FIGURE C-5

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 6 (OCEAN SPRAY RUBYRED) OVER ALL 22 MODEL SPECIFICATIONS

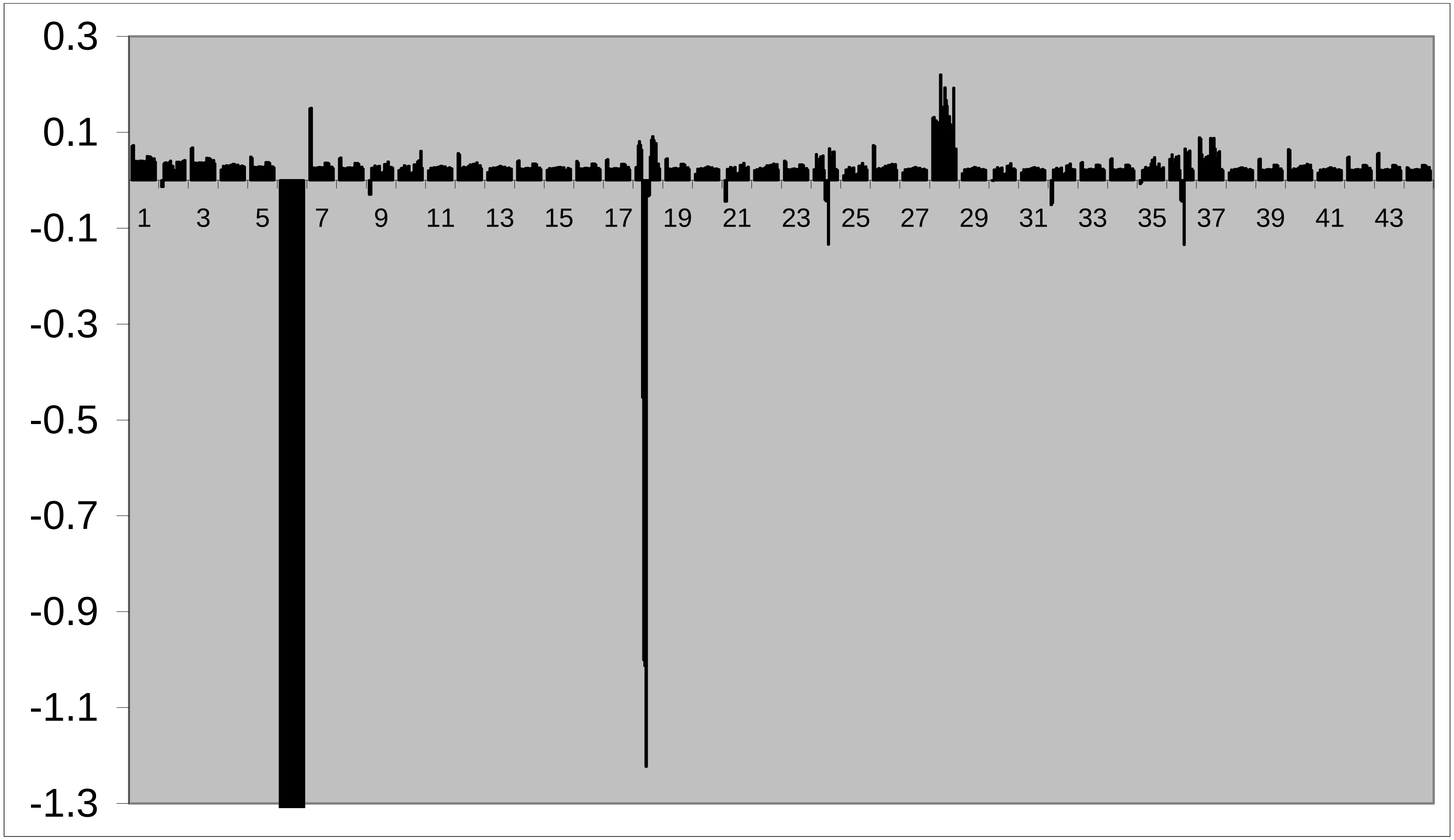


FIGURE C-6

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 7 (DOMINICK'S CRANBERRY JUICE) OVER ALL 22 MODEL SPECIFICATIONS

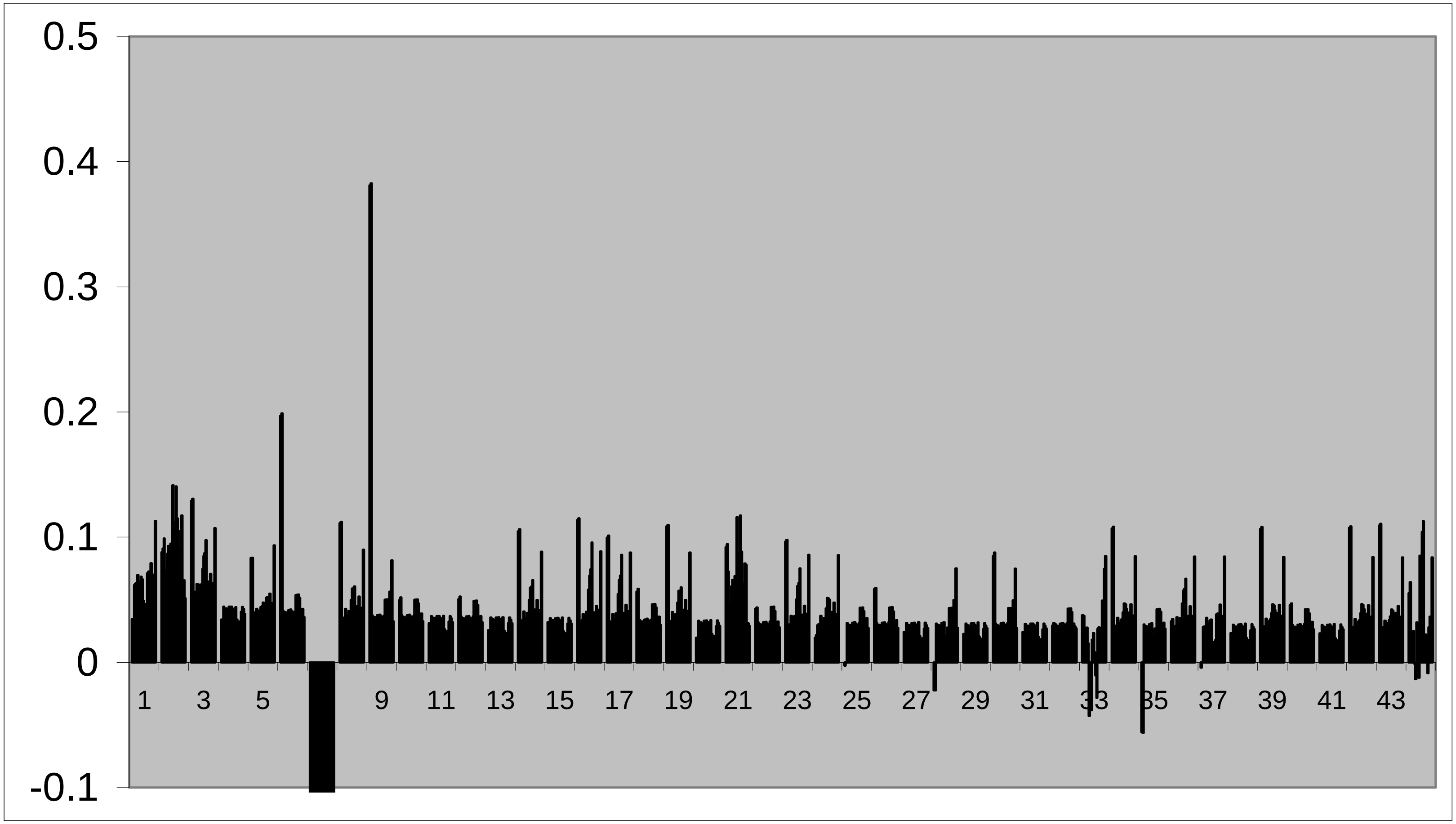


FIGURE C-7

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 8 (MUSSELLMAN'S APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

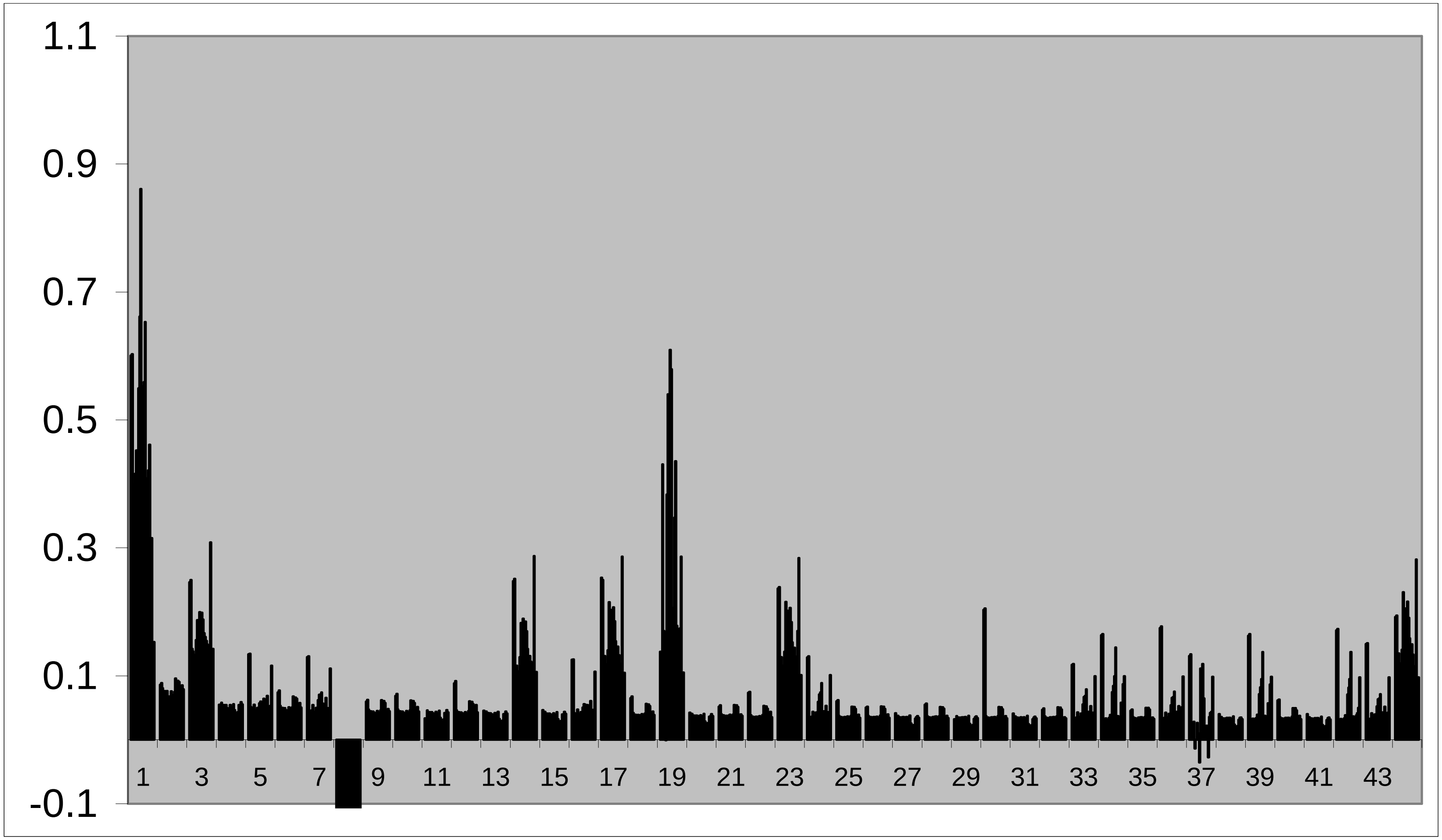


FIGURE C-8

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 10 (OCEAN SPRAY CRANRASPBERRY) OVER ALL 22 MODEL SPECIFICATIONS

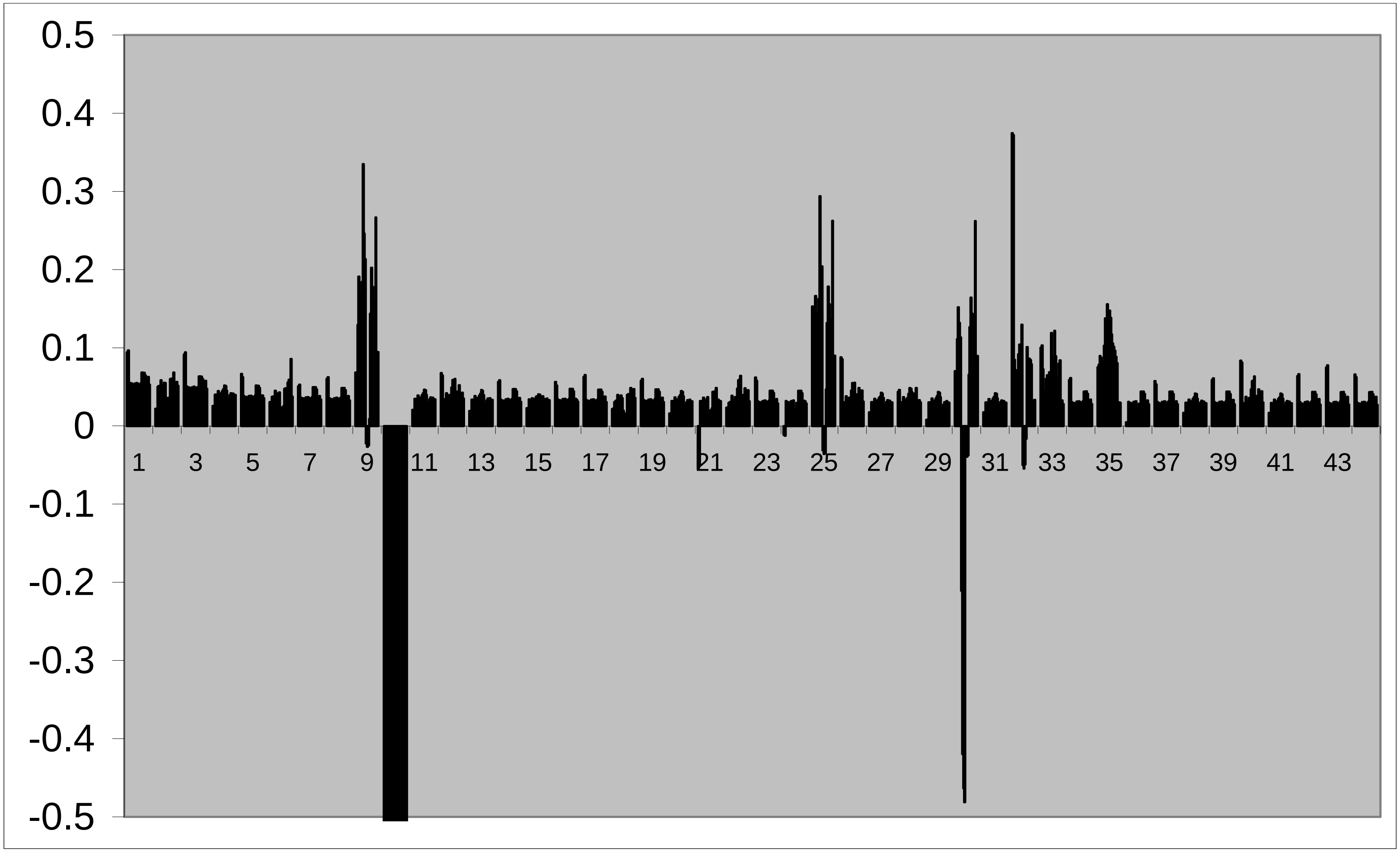


FIGURE C-9

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 11 (GATORADE ORANGE) OVER ALL 22 MODEL SPECIFICATIONS

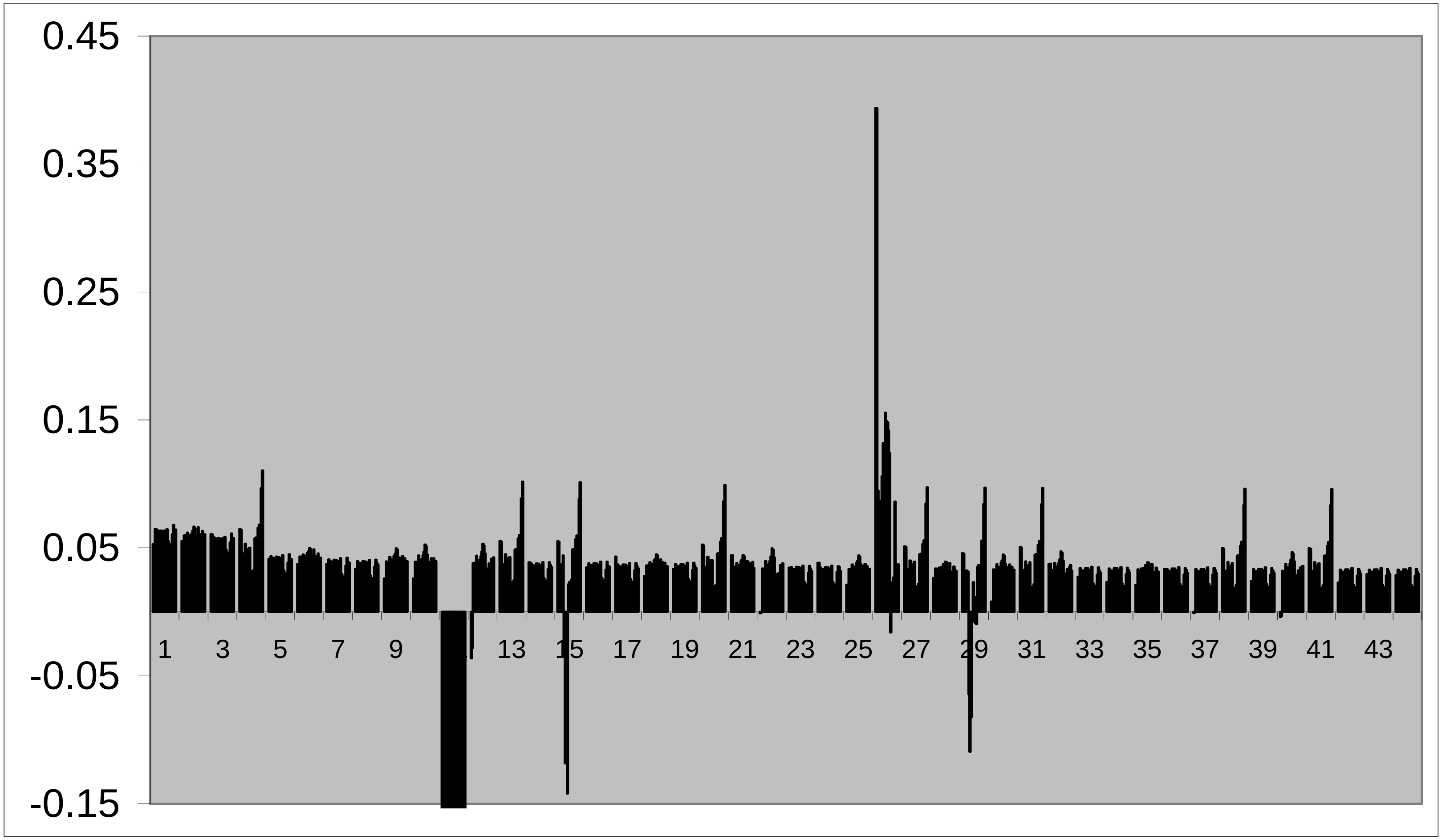


FIGURE C-10

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 12 (HAWAIIAN PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

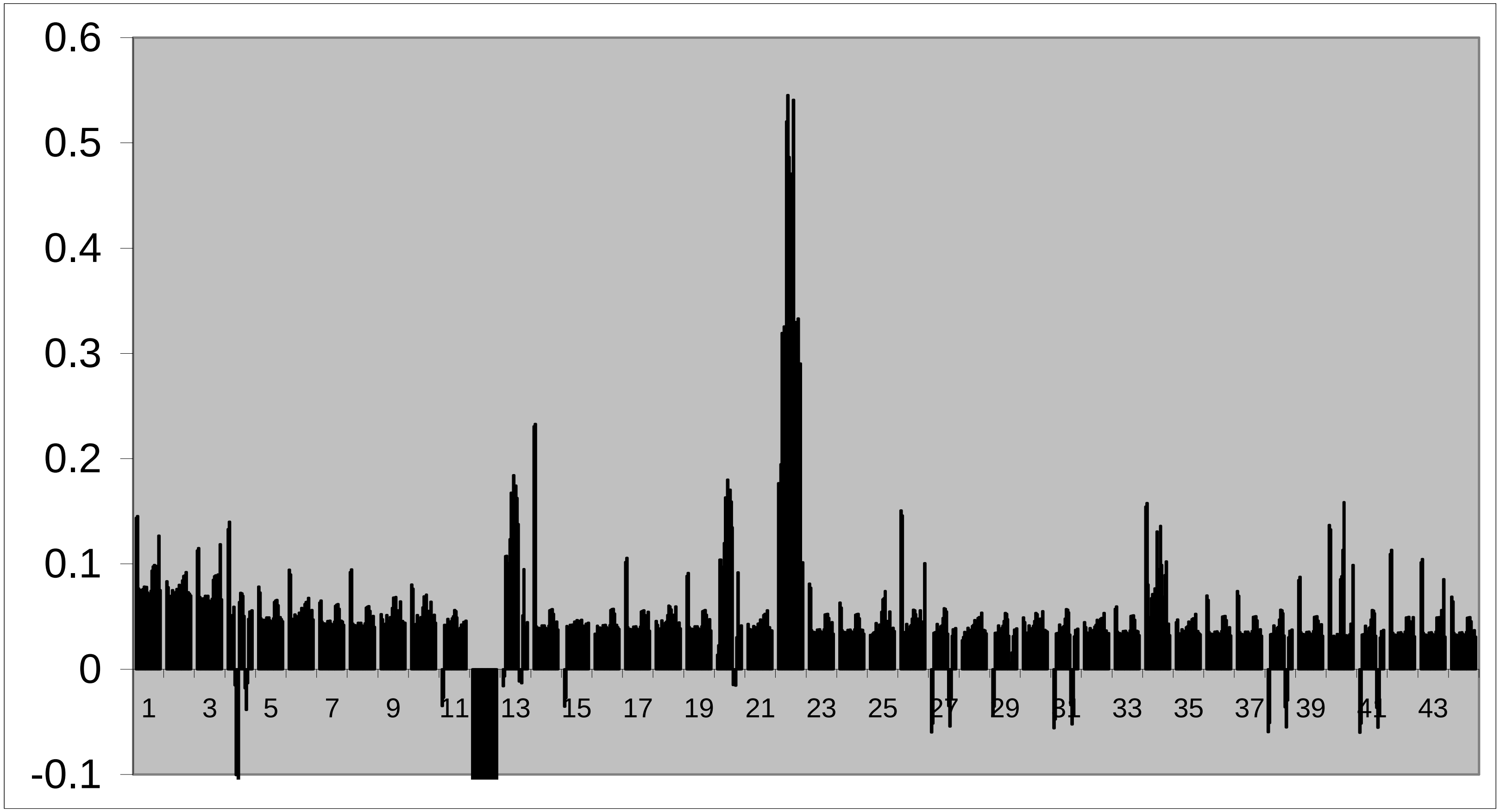


FIGURE C-11

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 13 (GATORADE FRUIT PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

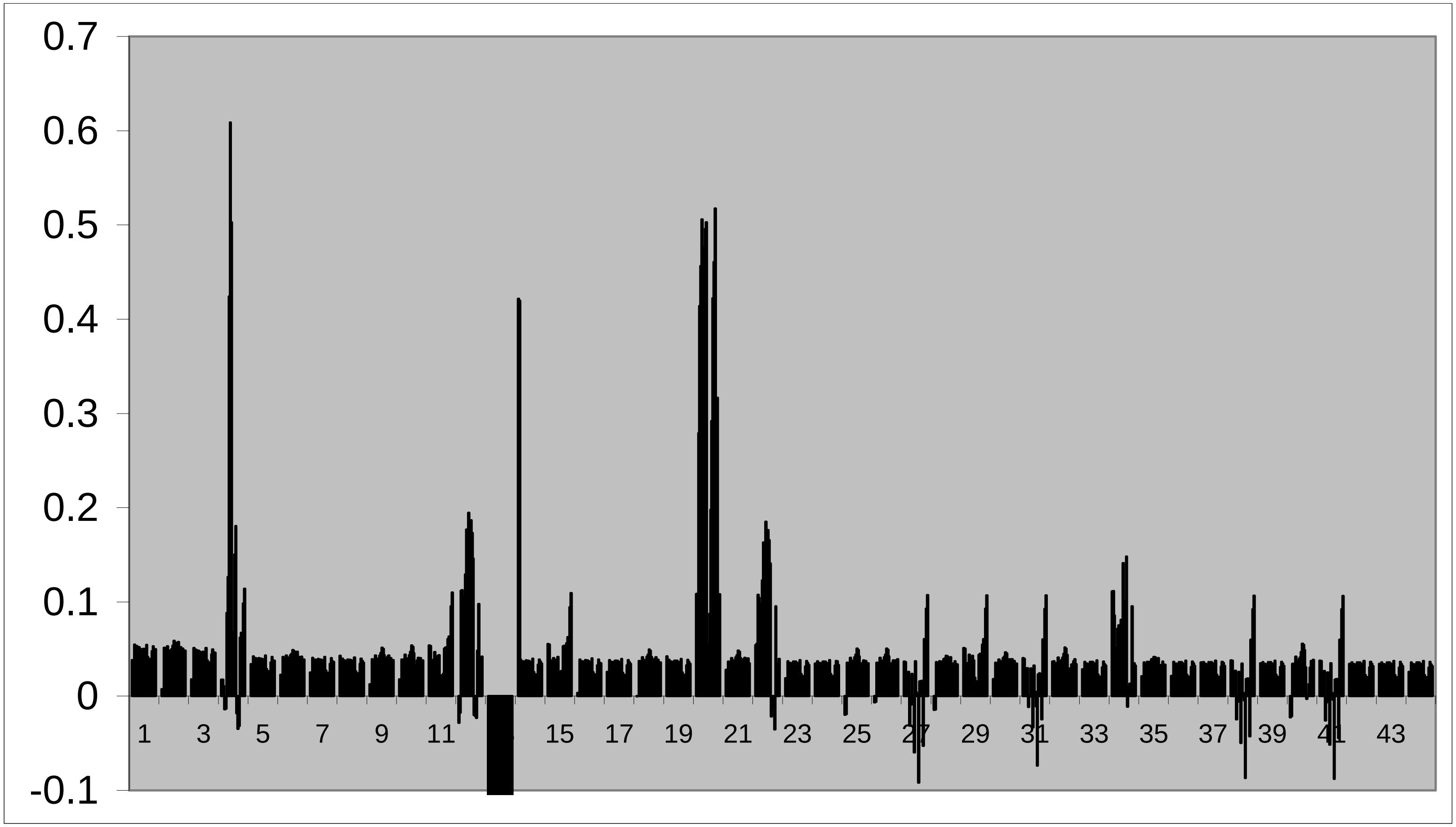


FIGURE C-12

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 14 (INDIAN SUMMER APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

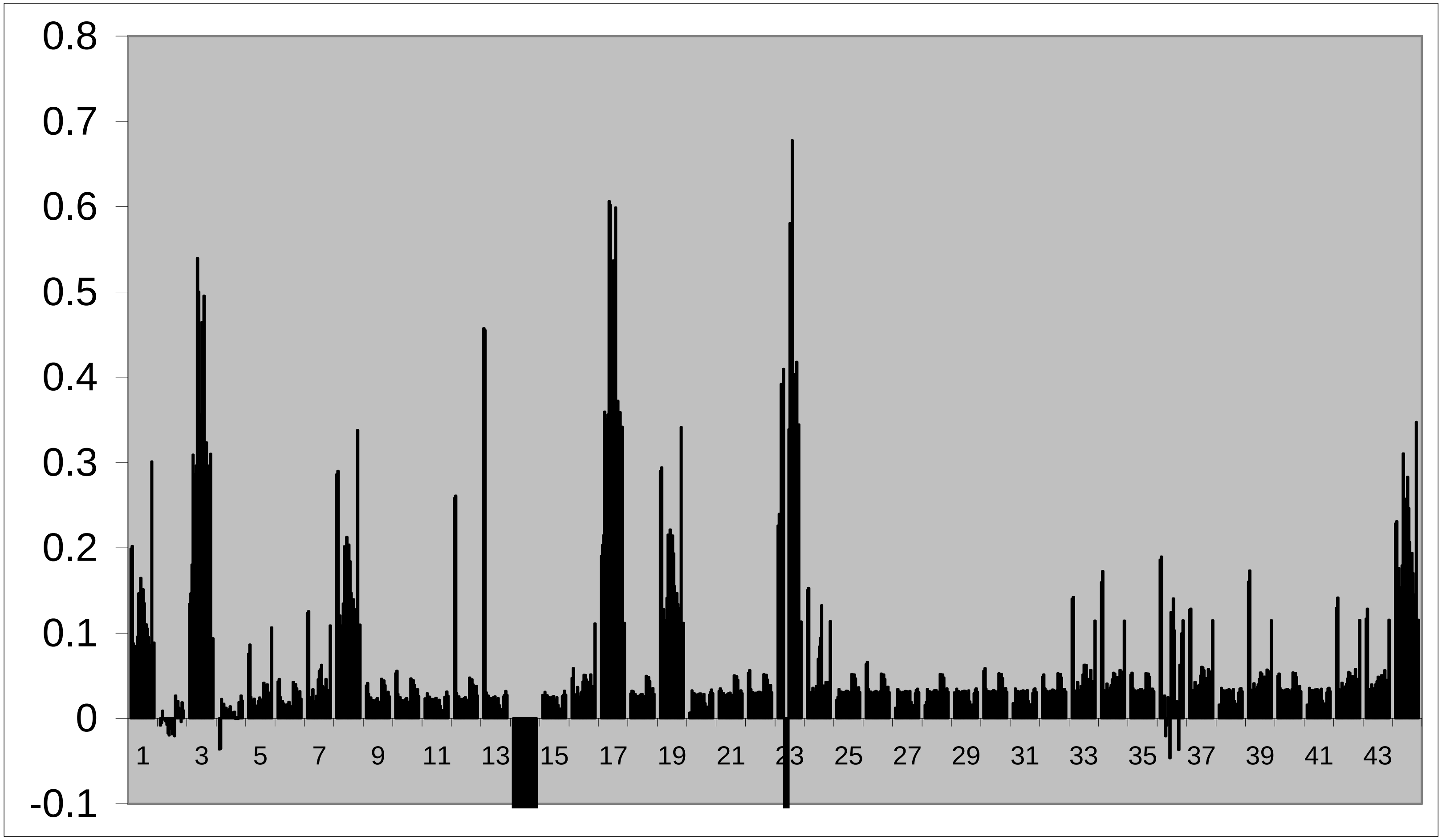


FIGURE C-13

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 15 (GATORADE LEMON-ICE PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

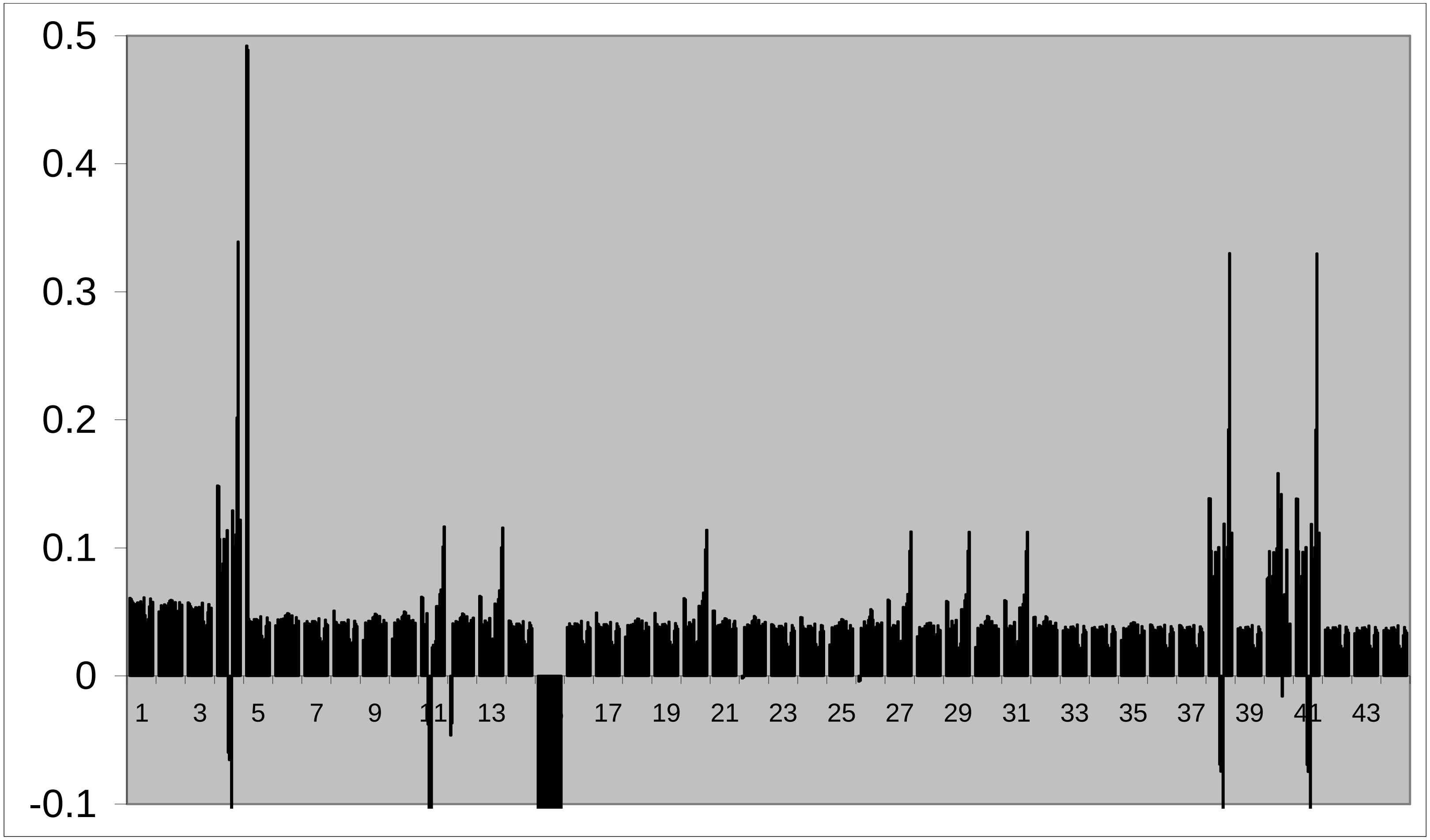


FIGURE C-14

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 16 (WELCH'S REGULAR GRAPE) OVER ALL 22 MODEL SPECIFICATIONS

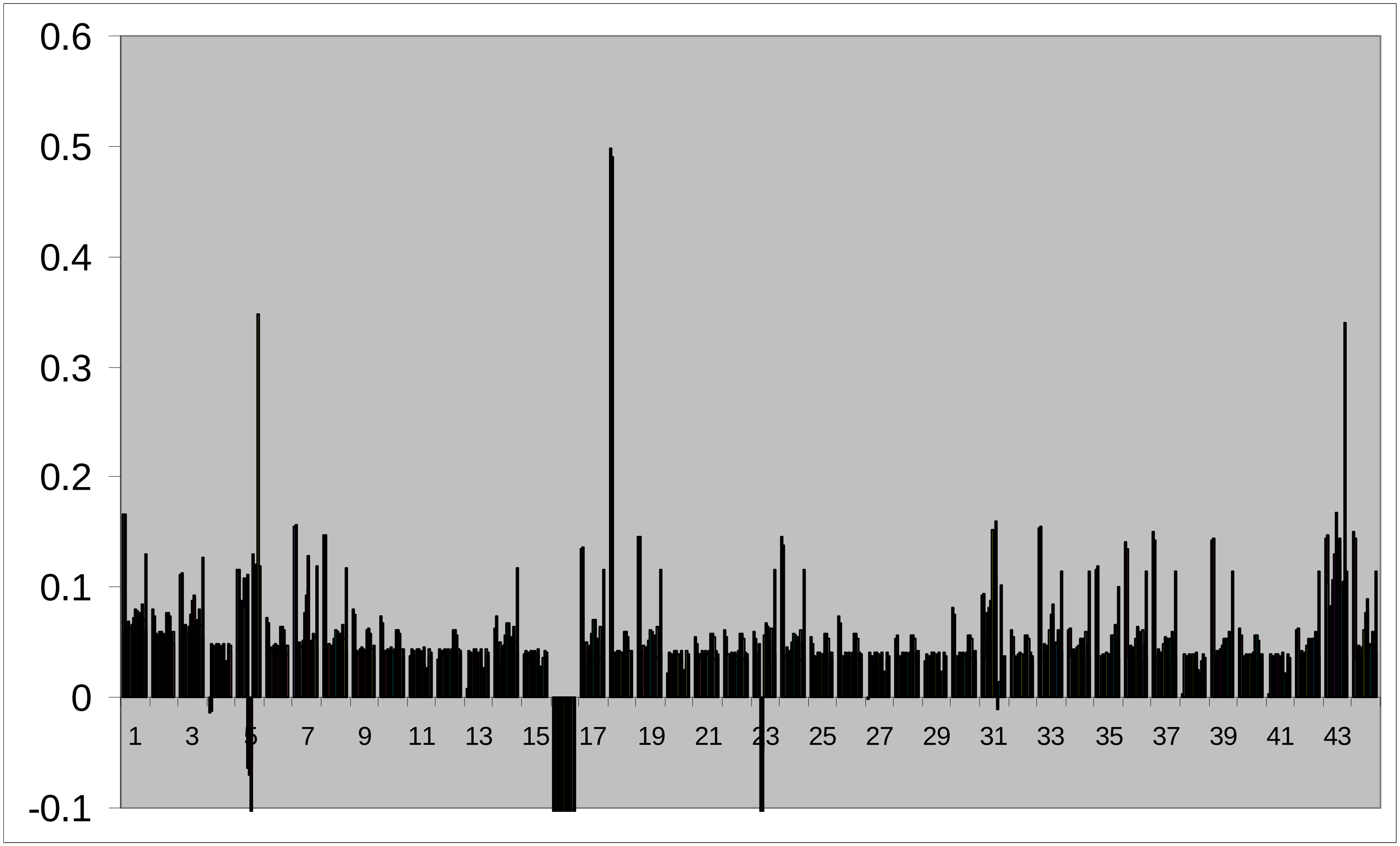


FIGURE C-15

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 17 (MOTT'S NATURAL APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

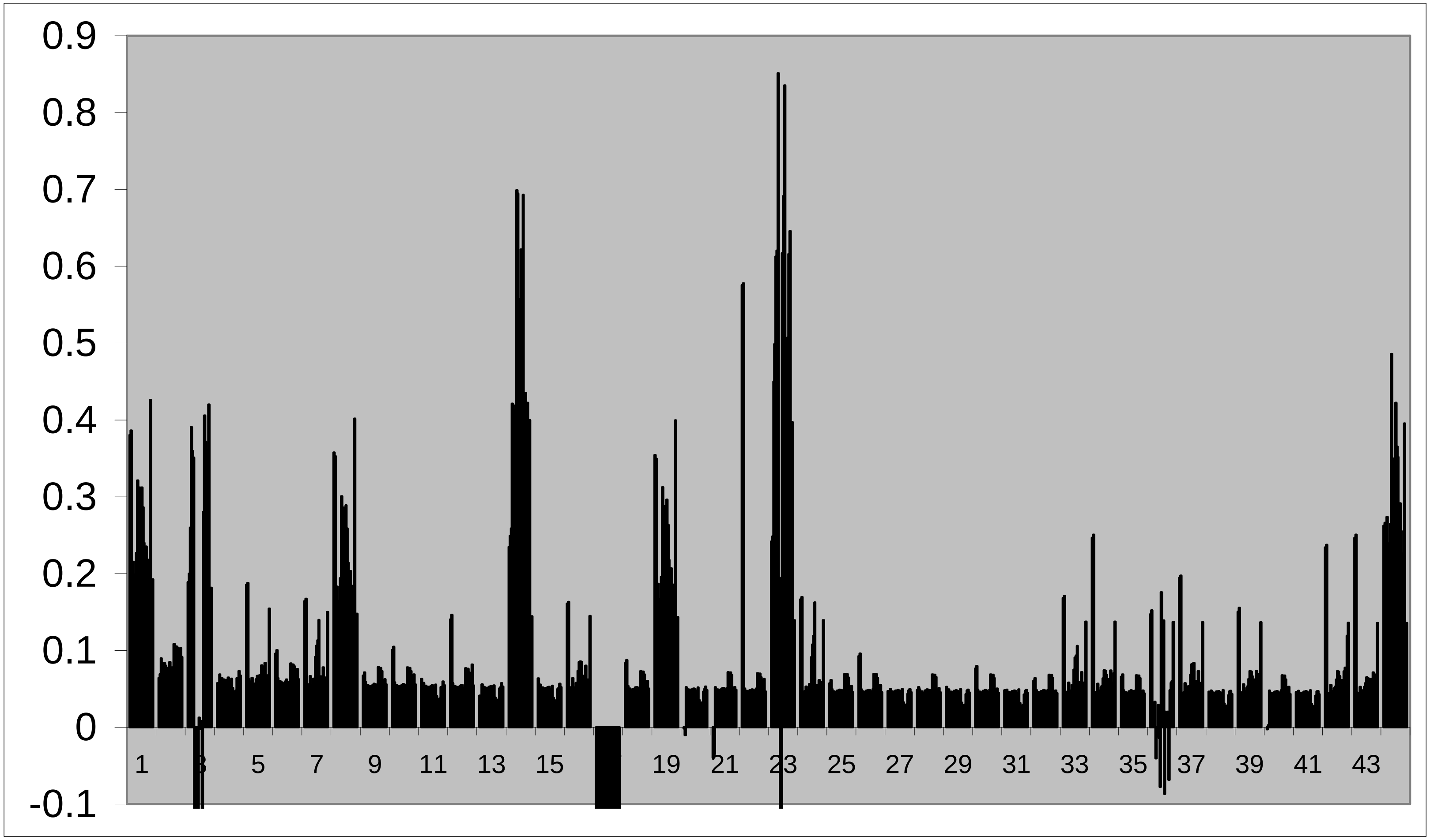


FIGURE C-16

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 18 (OCEAN SPRAY RUBYRED AND TANGERINE) OVER ALL 22 MODEL SPECIFICATIONS

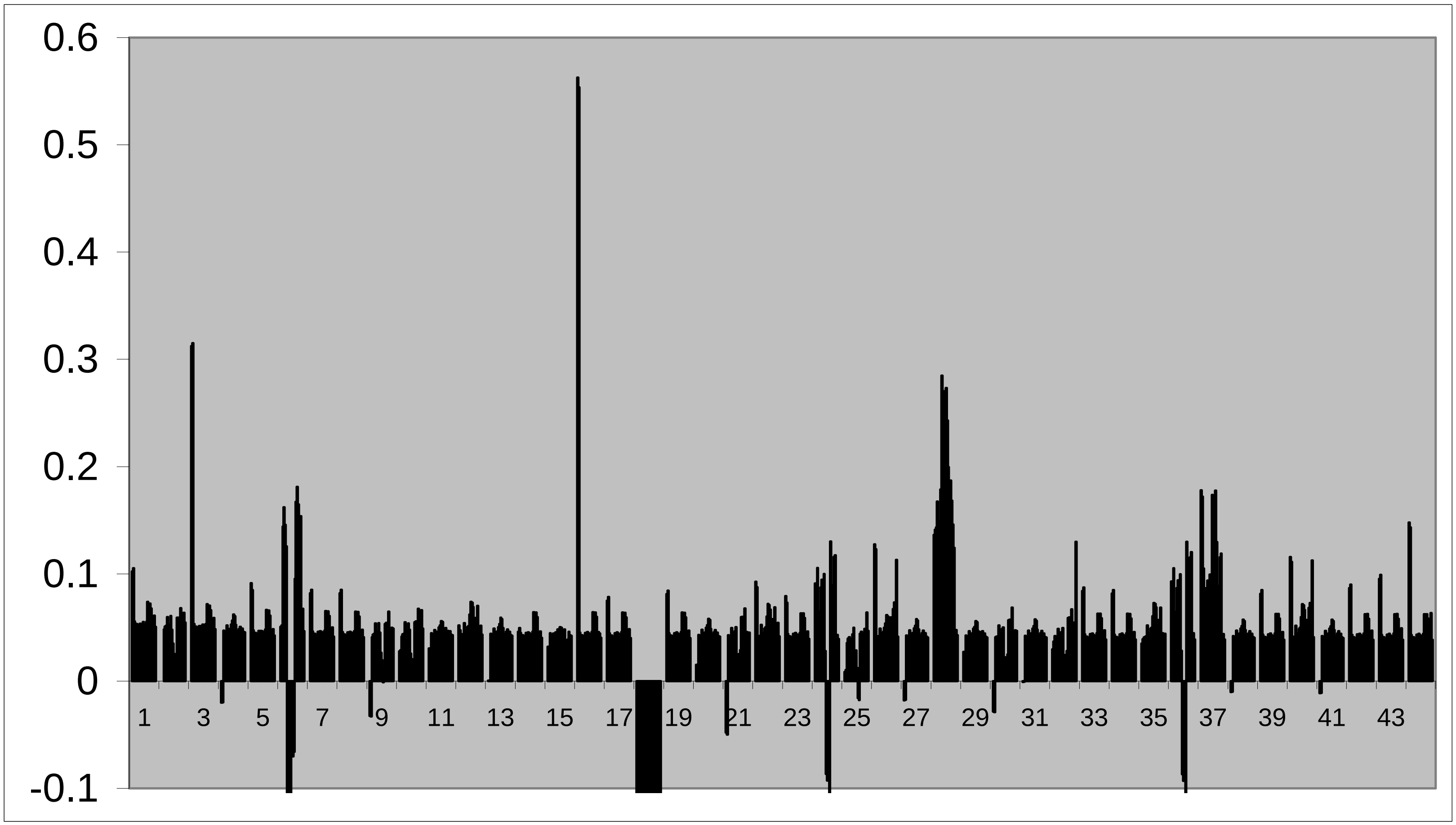


FIGURE C-17

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 19 (TREETOP APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

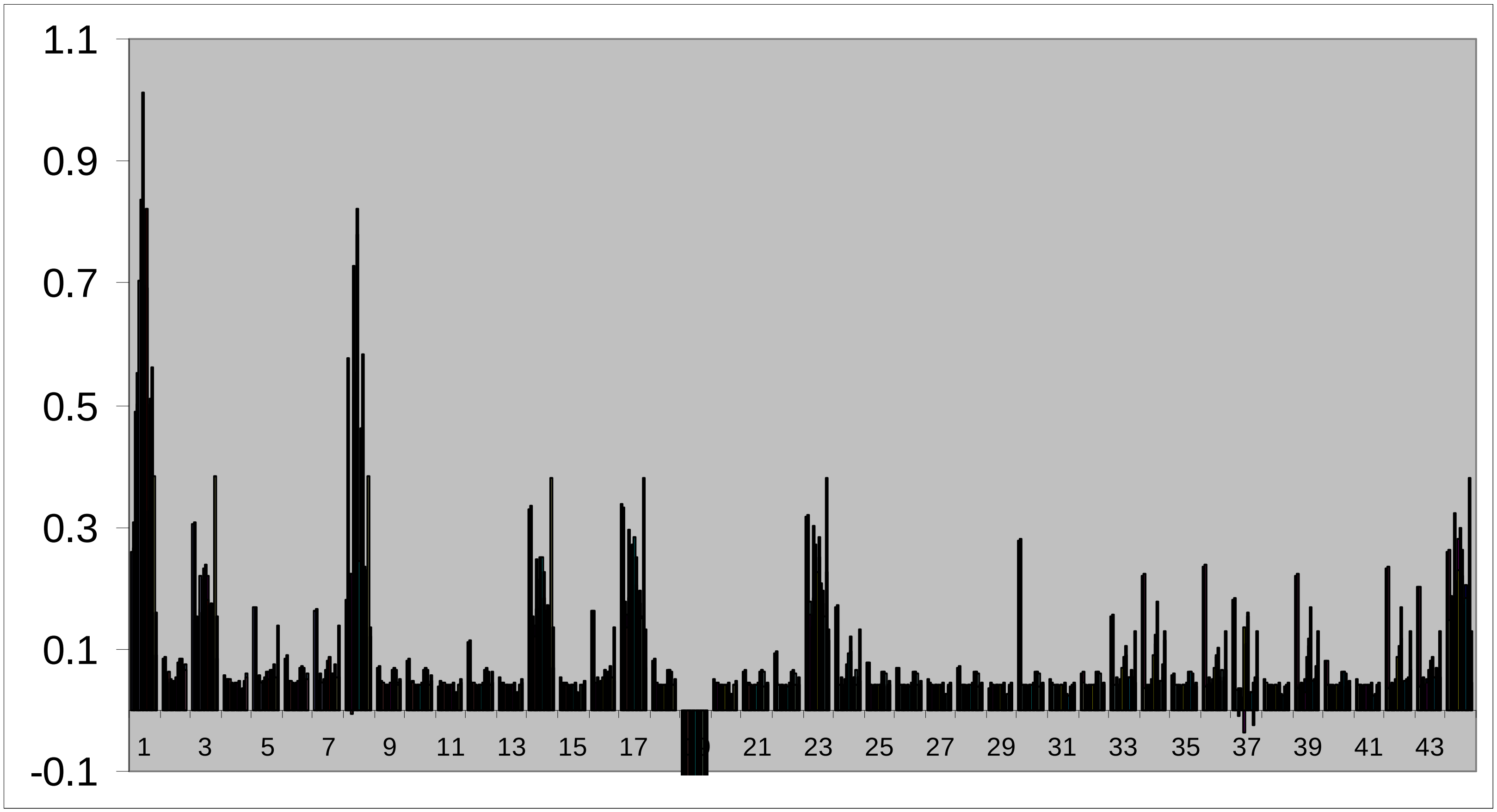


FIGURE C-18

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 20 (GATORADE TROPICAL PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

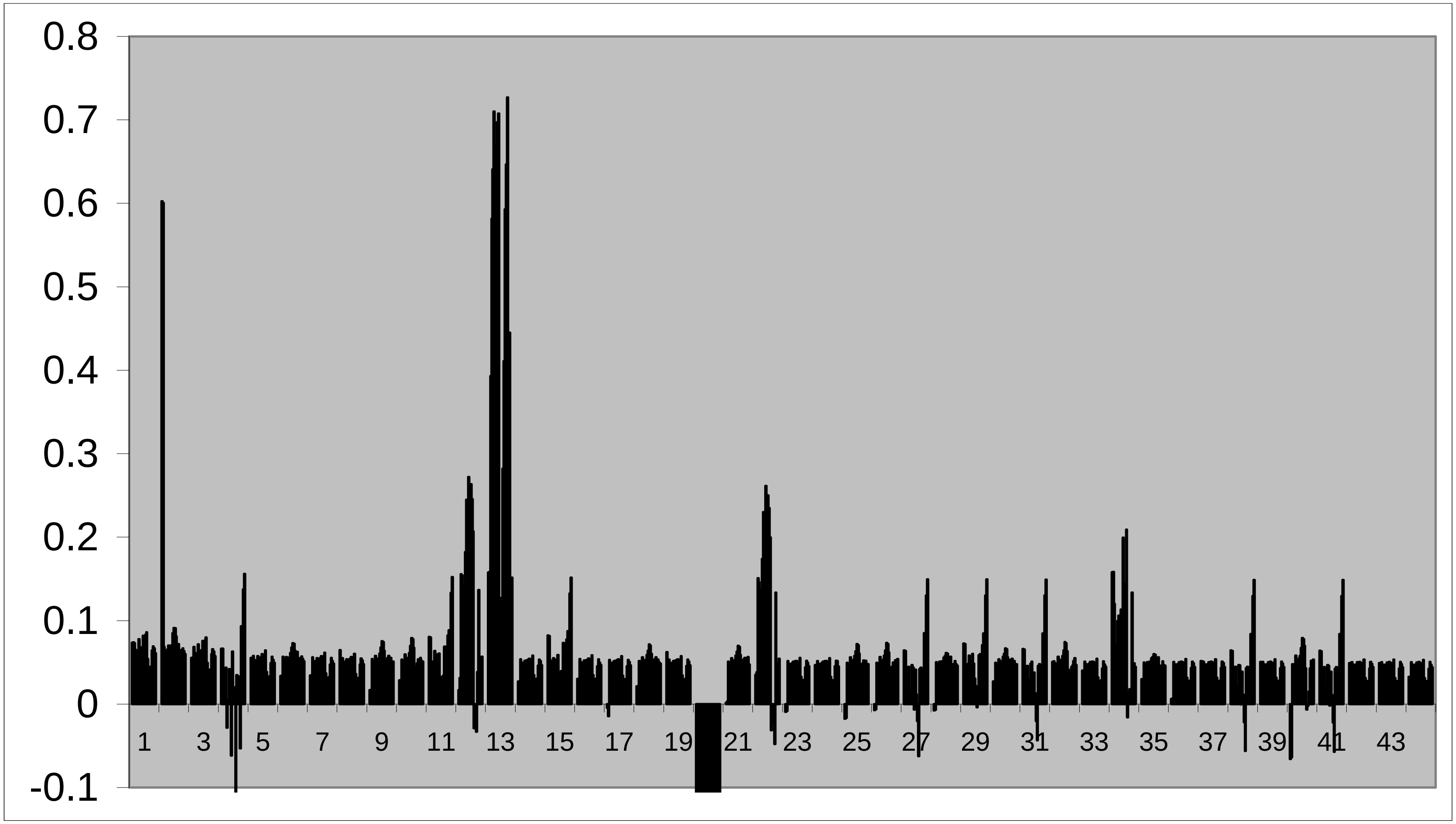


FIGURE C-19

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 21 (OCEAN SPRAY LOW CALORIE CRANBERRY) OVER ALL 22 MODEL SPECIFICATIONS

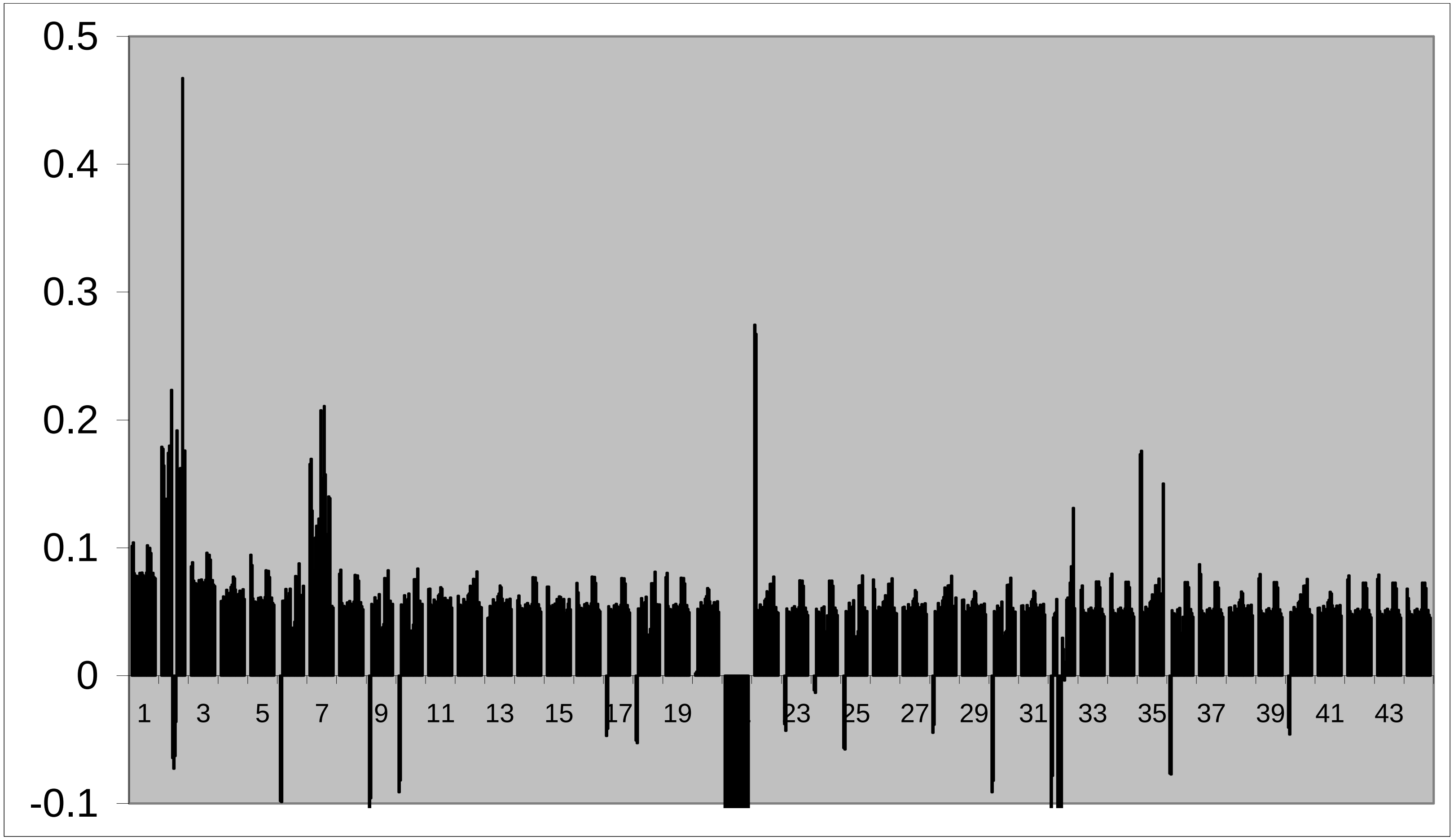


FIGURE C-20

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 22 (HI-C FRUIT PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

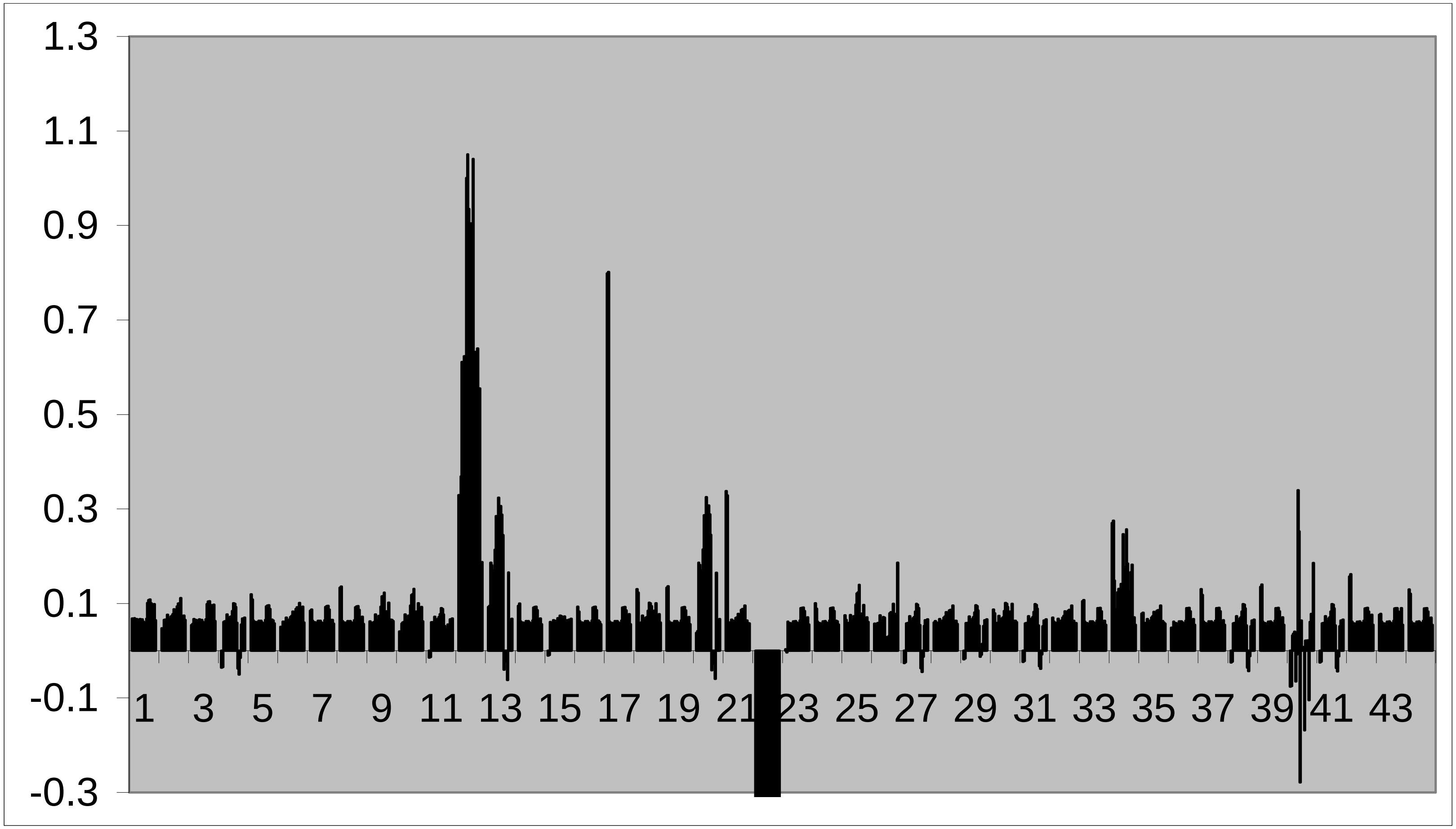


FIGURE C-21

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 23 (MINUTEMAID APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS

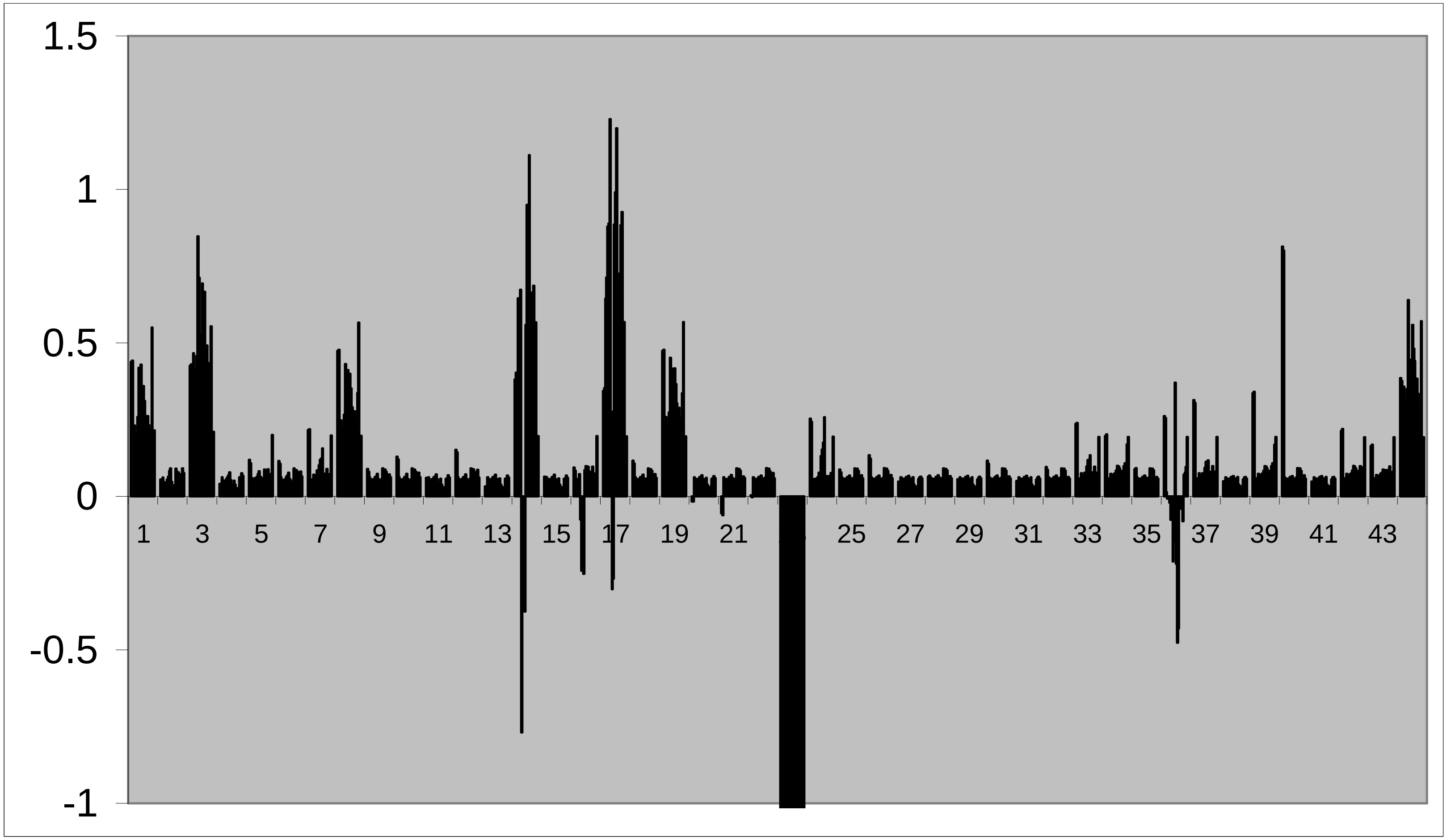


FIGURE C-22

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 24 (OCEAN SPRAY GRAPEFRUIT JUICE) OVER ALL 22 MODEL SPECIFICATIONS

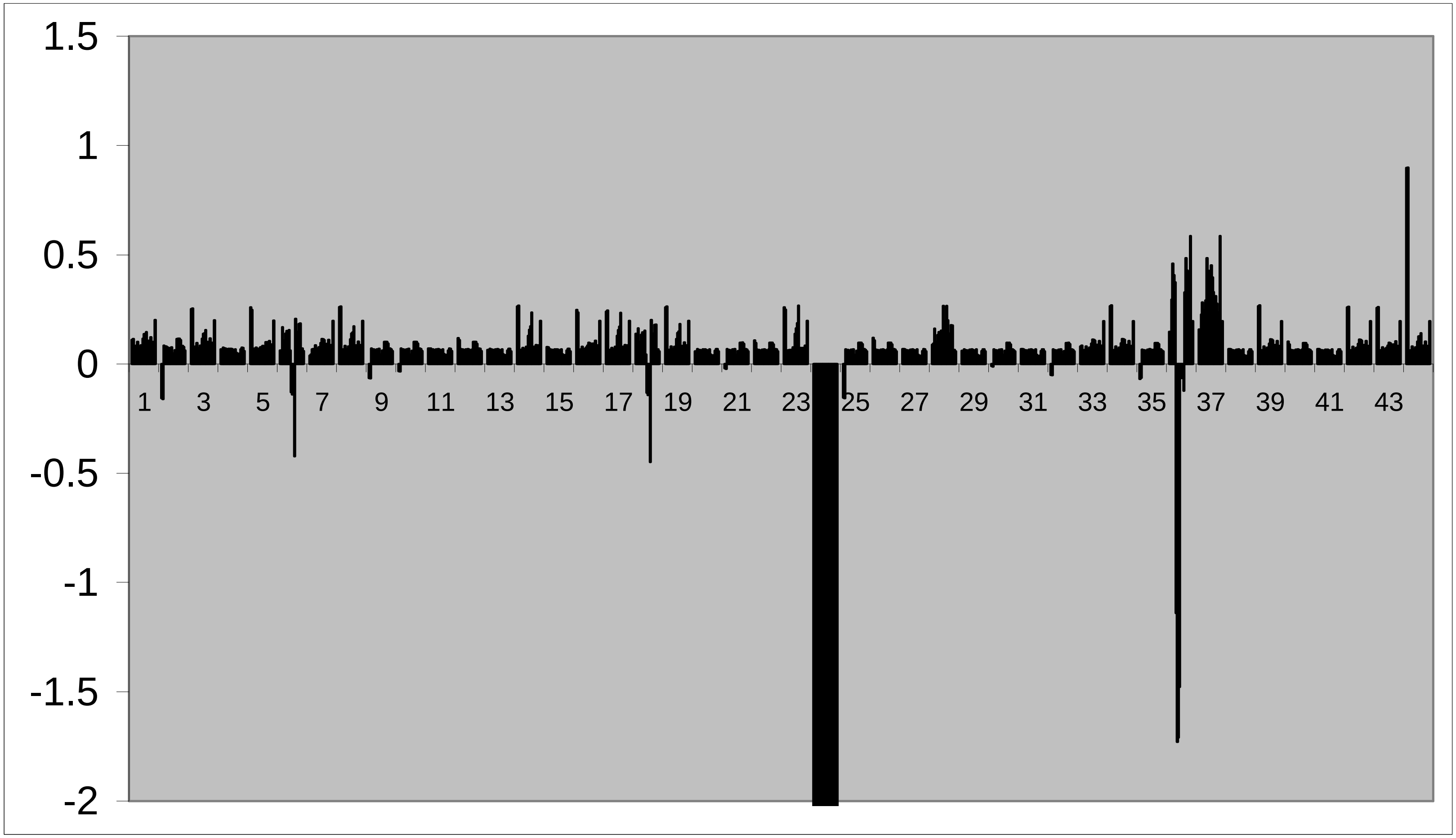


FIGURE C-23

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 25 (OCEAN SPRAY CRANCHERRY) OVER ALL 22 MODEL SPECIFICATIONS

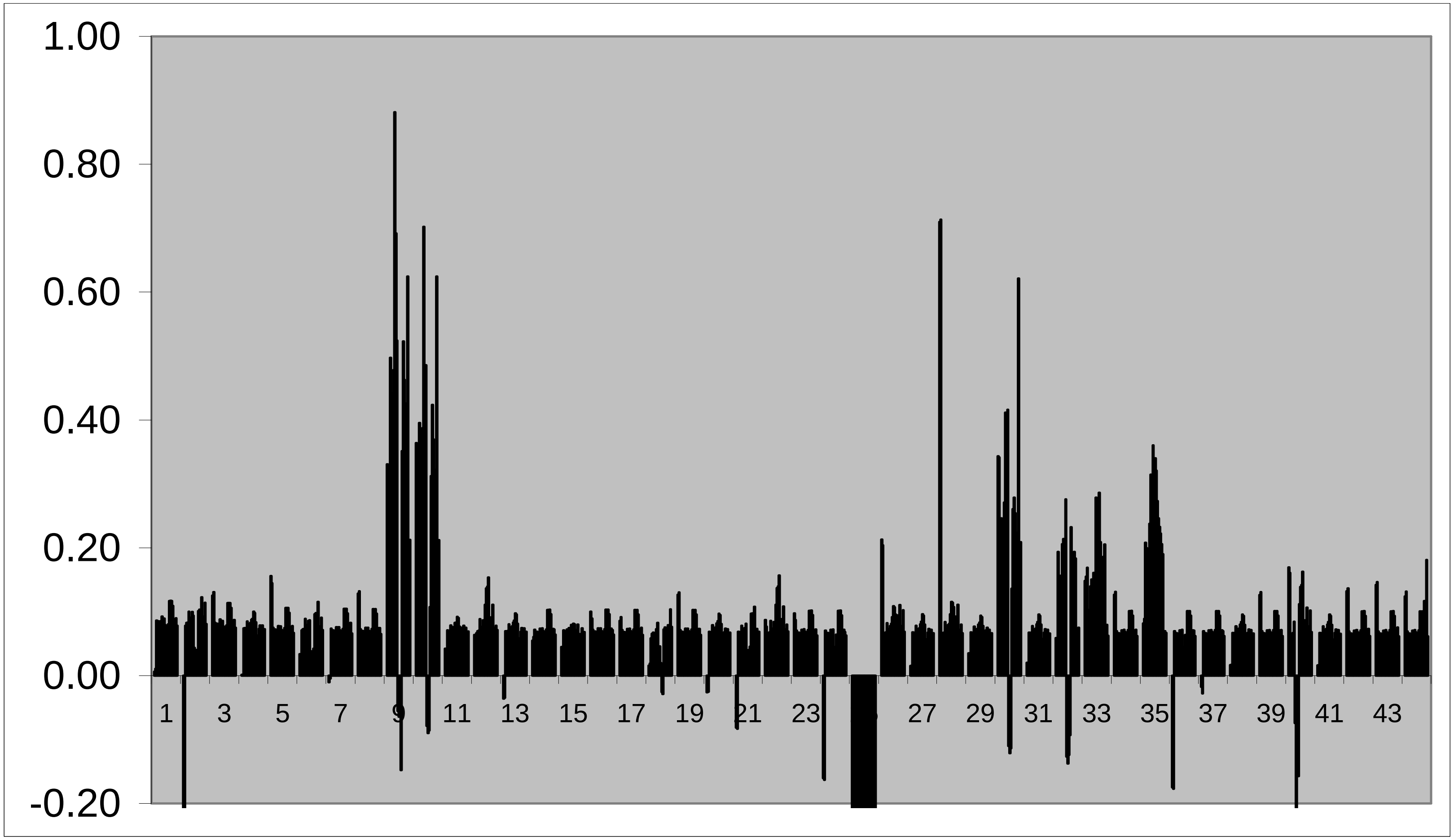


FIGURE C-24

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 26 (HI-C ORANGE) OVER ALL 22 MODEL SPECIFICATIONS

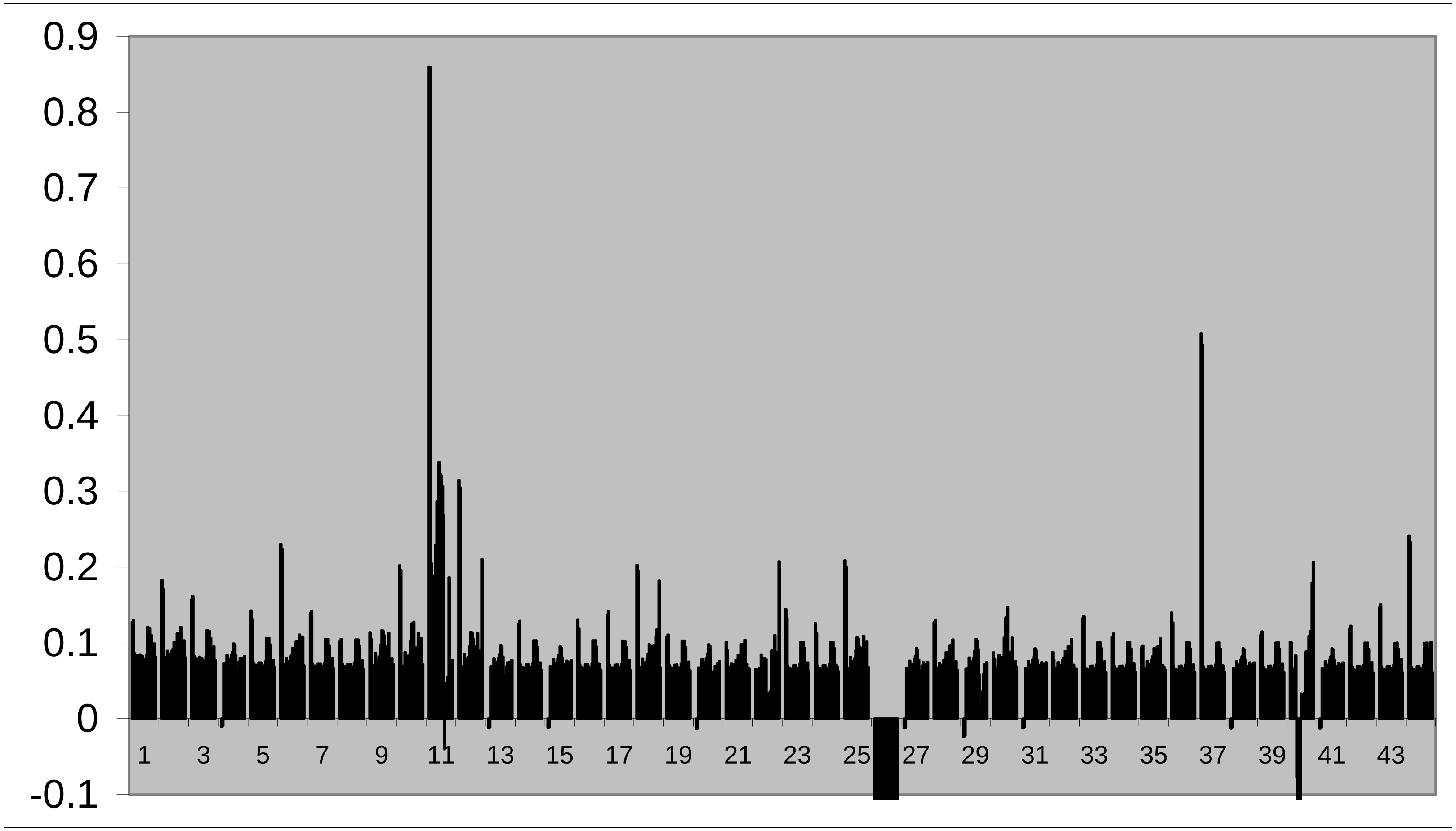


FIGURE C-25

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 27 (GATORADE WATERMELON) OVER ALL 22 MODEL SPECIFICATIONS

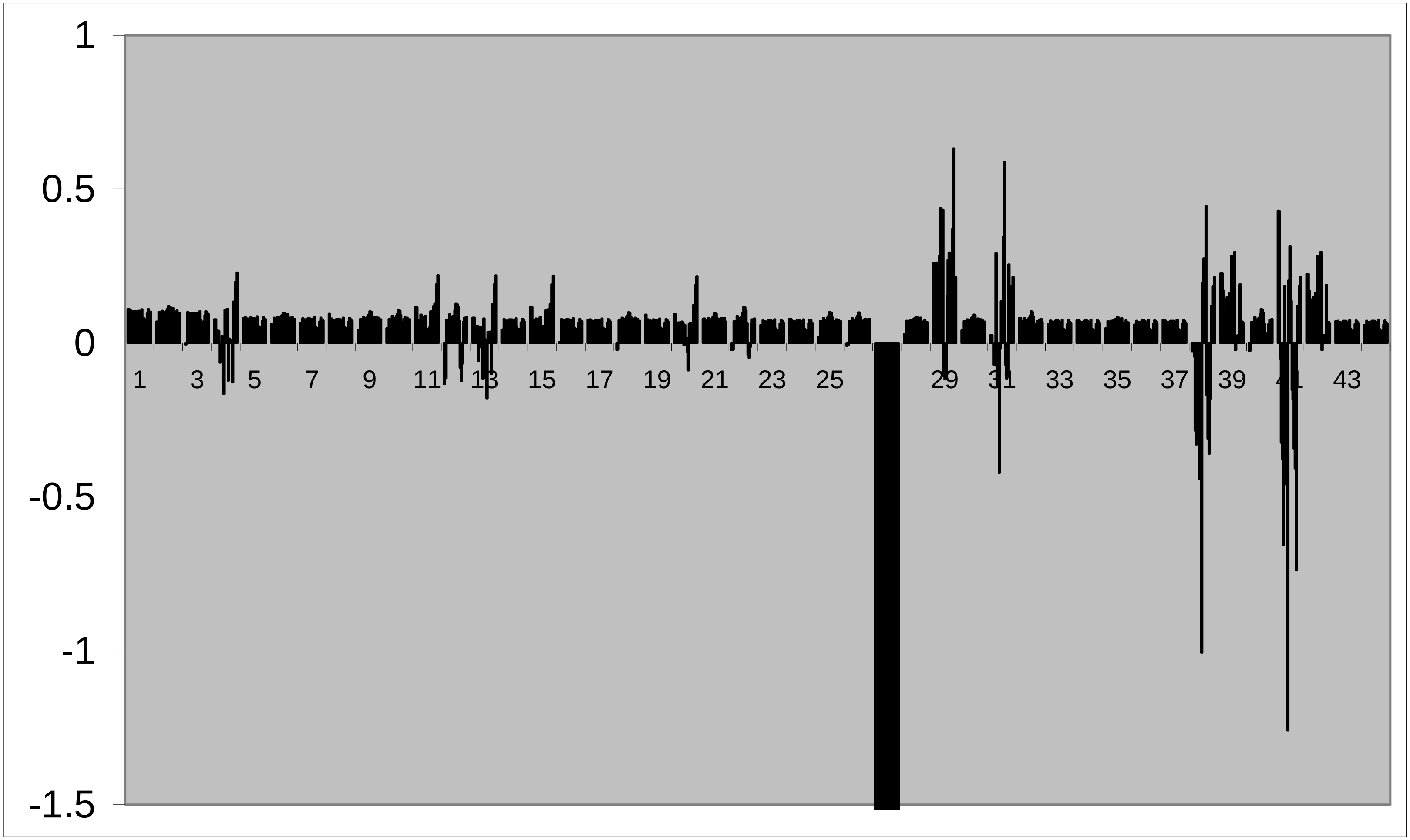


FIGURE C-26

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 28 (DOMINICK'S RUBYRED GRAPEFRUIT JUICE) OVER ALL 22 MODEL SPECIFICATIONS

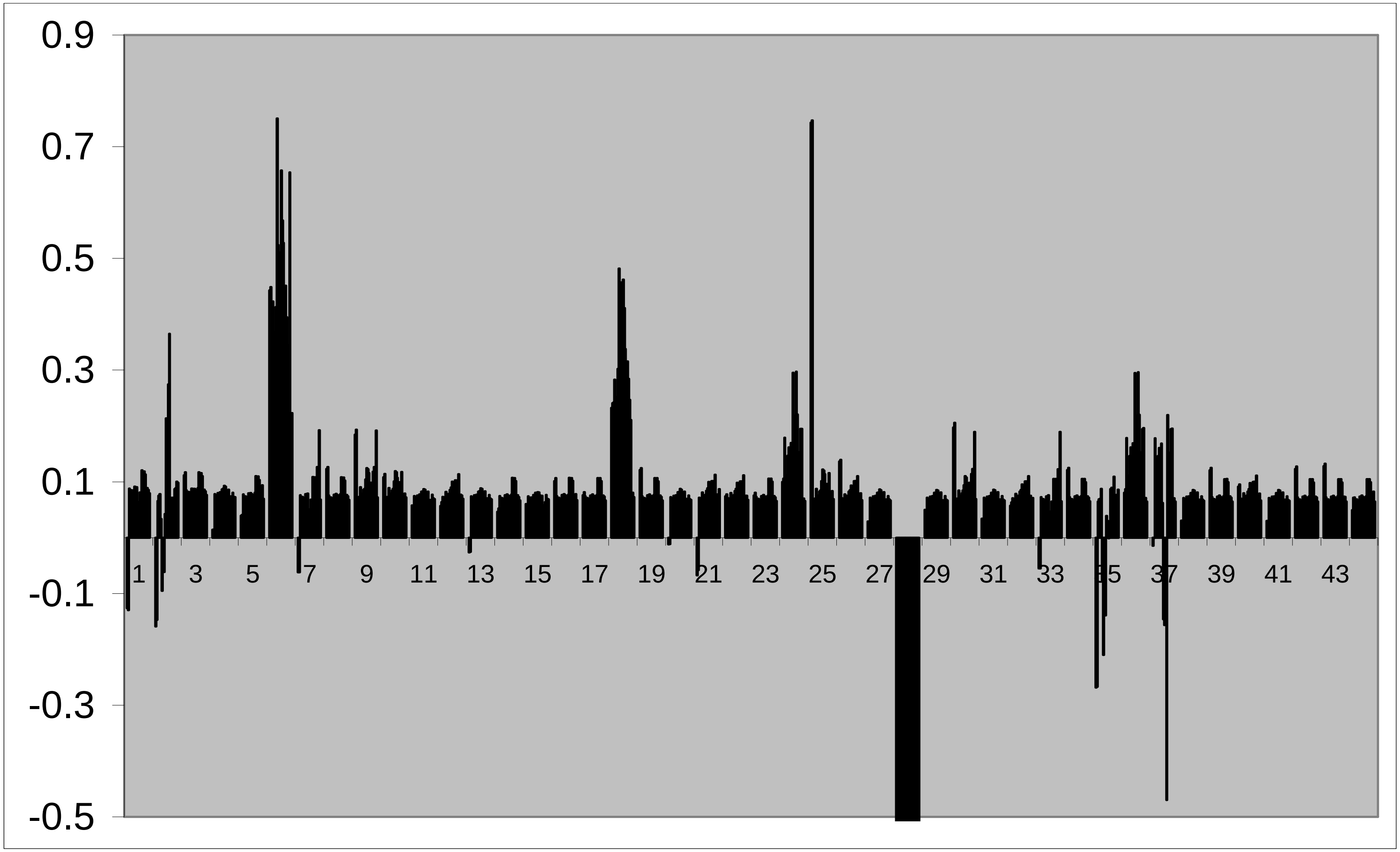


FIGURE C-27

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 29 (GATORADE BLUE RASPBERRY) OVER ALL 22 MODEL SPECIFICATIONS

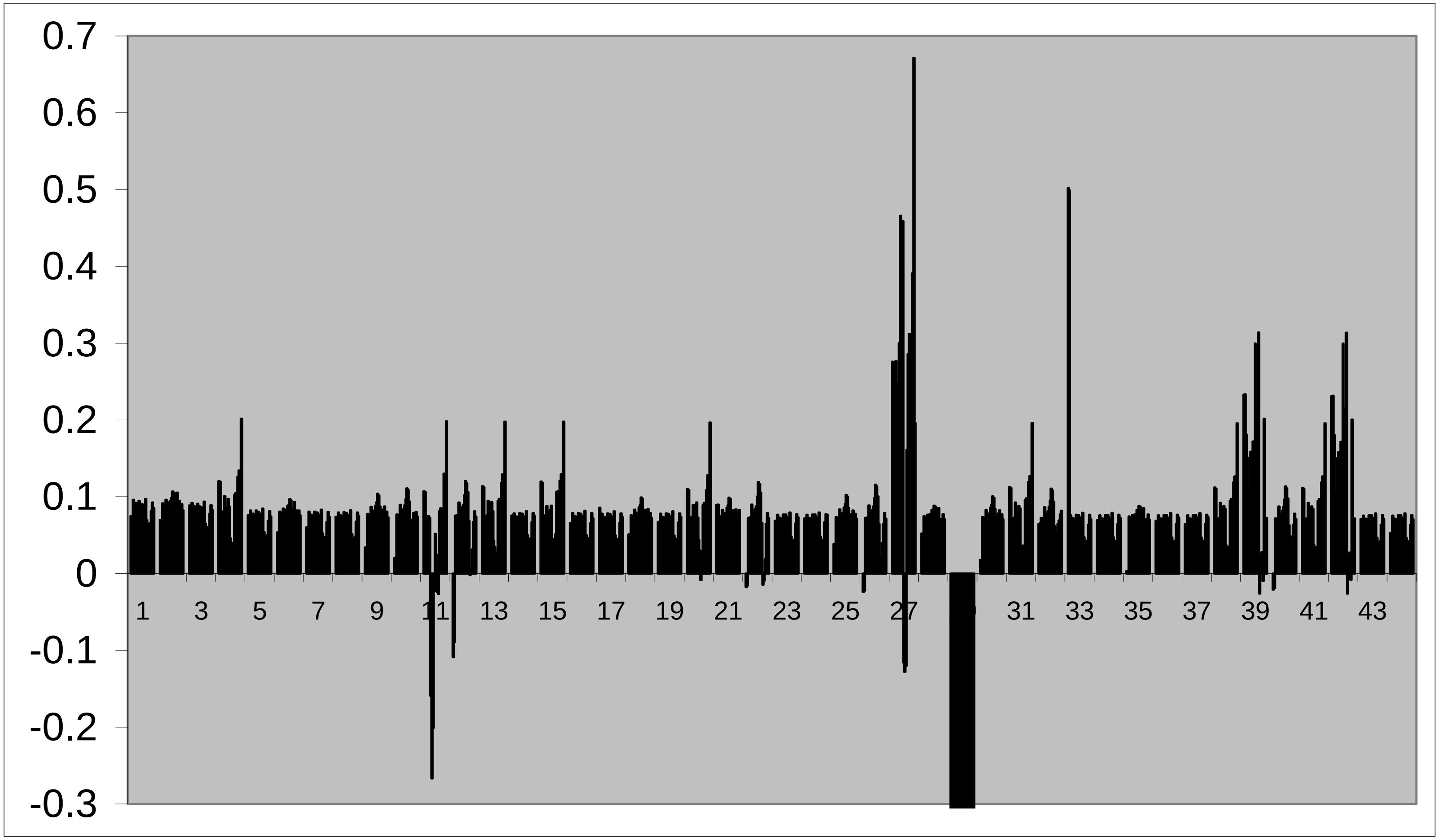


FIGURE C-28

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 30 (OCEAN SPRAY CRANGRAPE) OVER ALL 22 MODEL SPECIFICATIONS

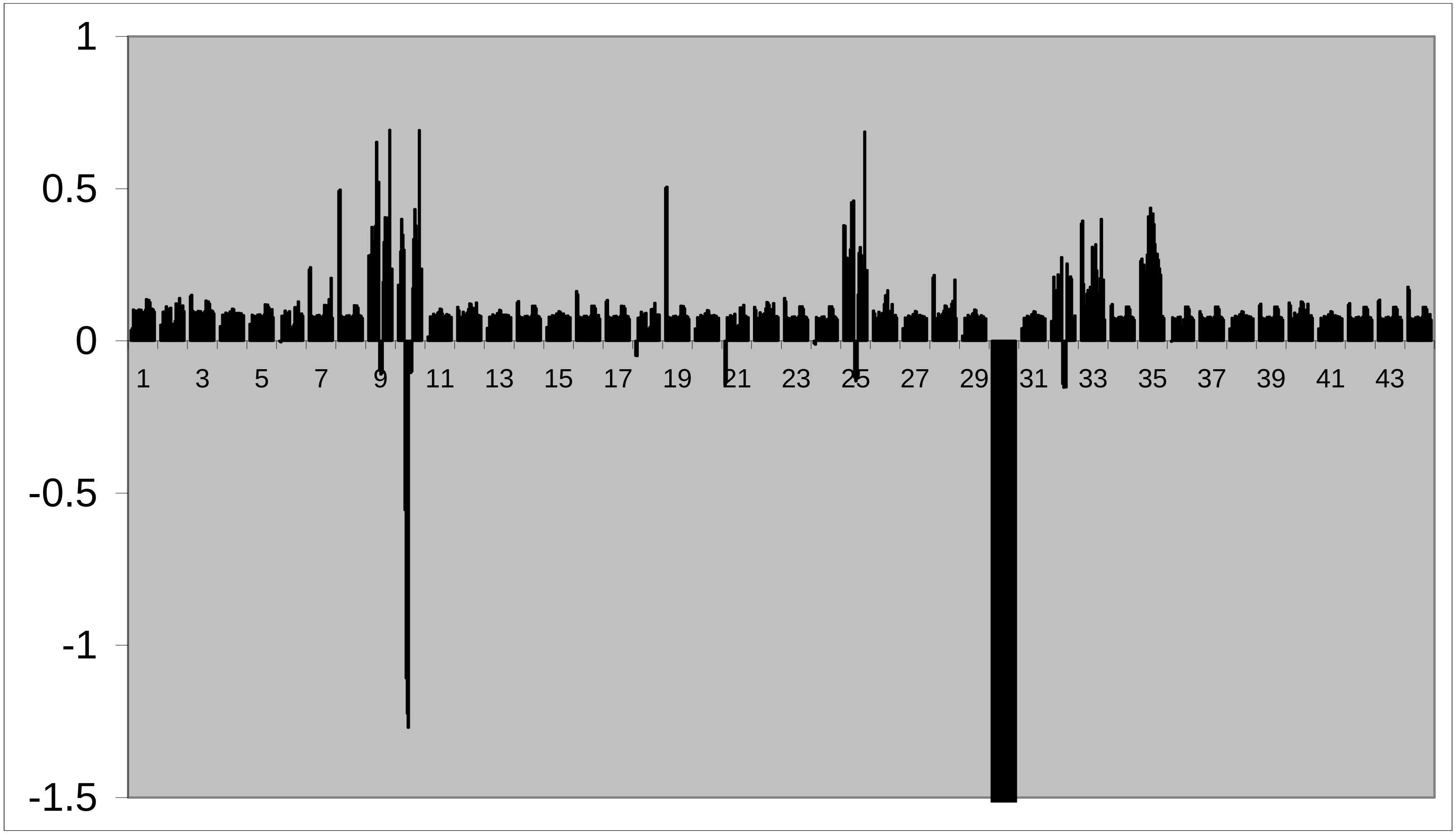


FIGURE C-29

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 31 (GATORADE GRAPE) OVER ALL 22 MODEL SPECIFICATIONS

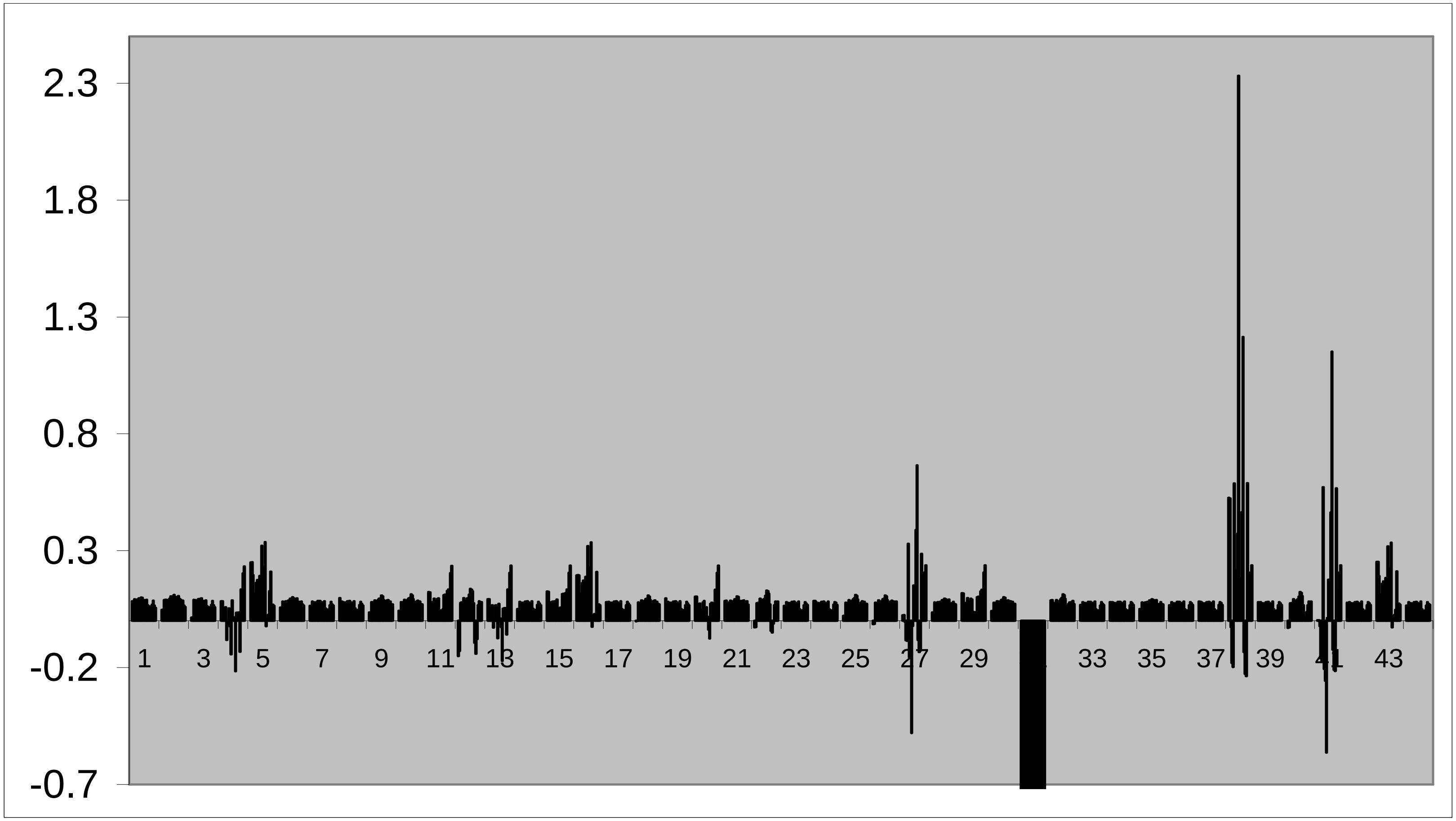


FIGURE C-30

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 32 (OCEAN SPRAY LOW CALORIE CRANRASPBERRY) OVER ALL 22 MODEL SPECIFICATIONS

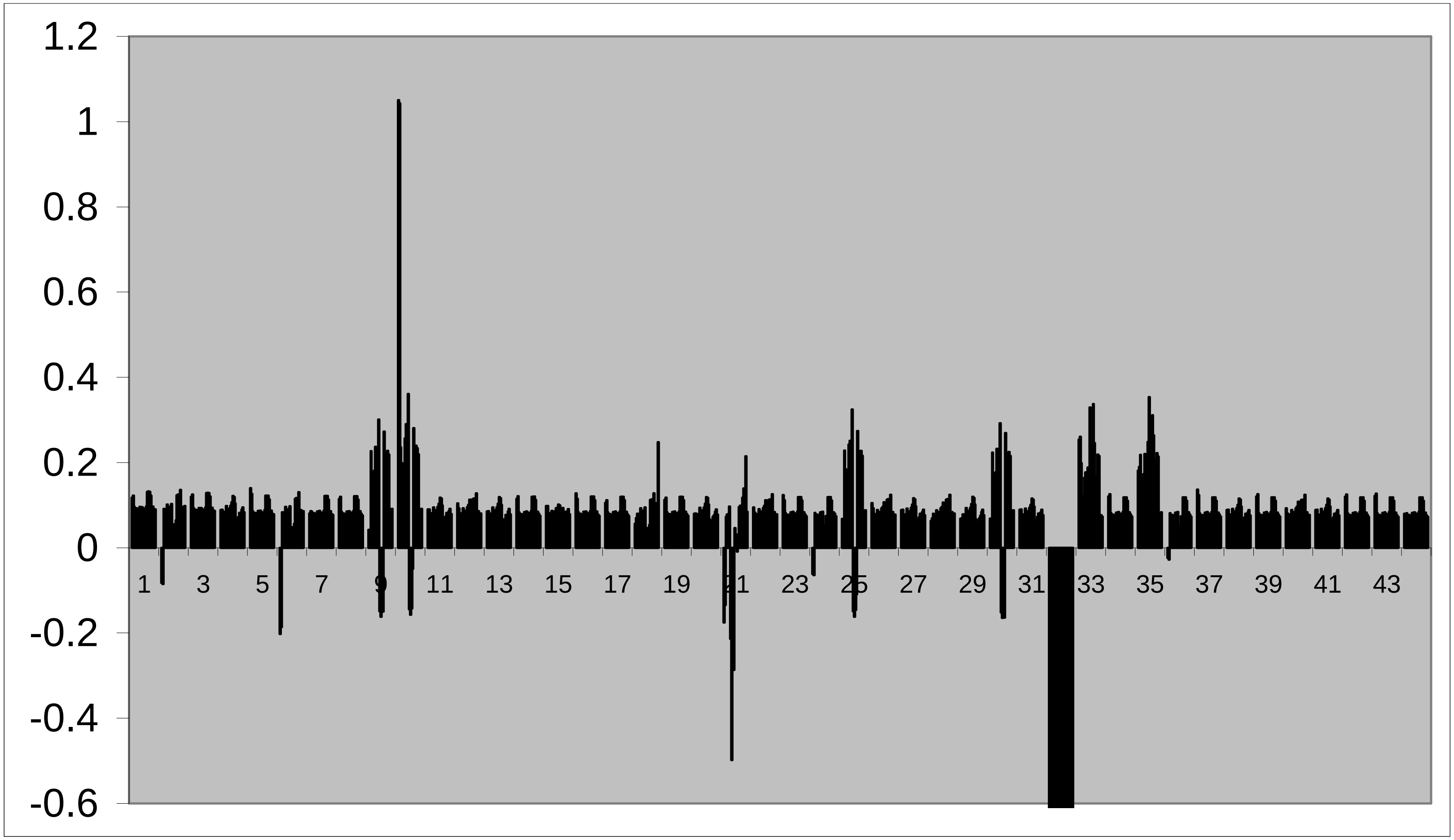


FIGURE C-31

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 33 (DOMINICK'S CRANRASPBERRY) OVER ALL 22 MODEL SPECIFICATIONS

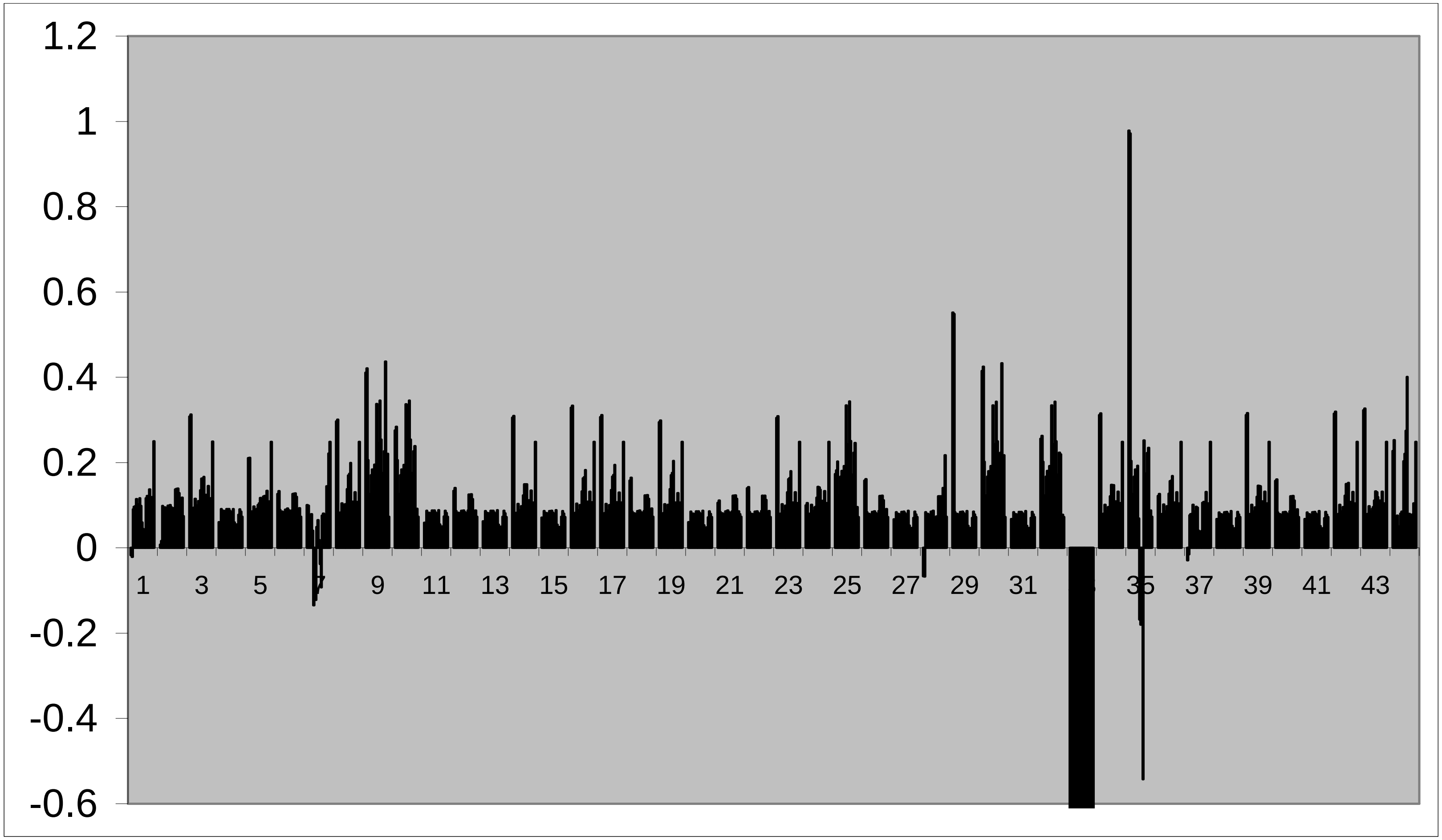


FIGURE C-32

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 34 (LIBBY PUNCH) OVER ALL 22 MODEL SPECIFICATIONS

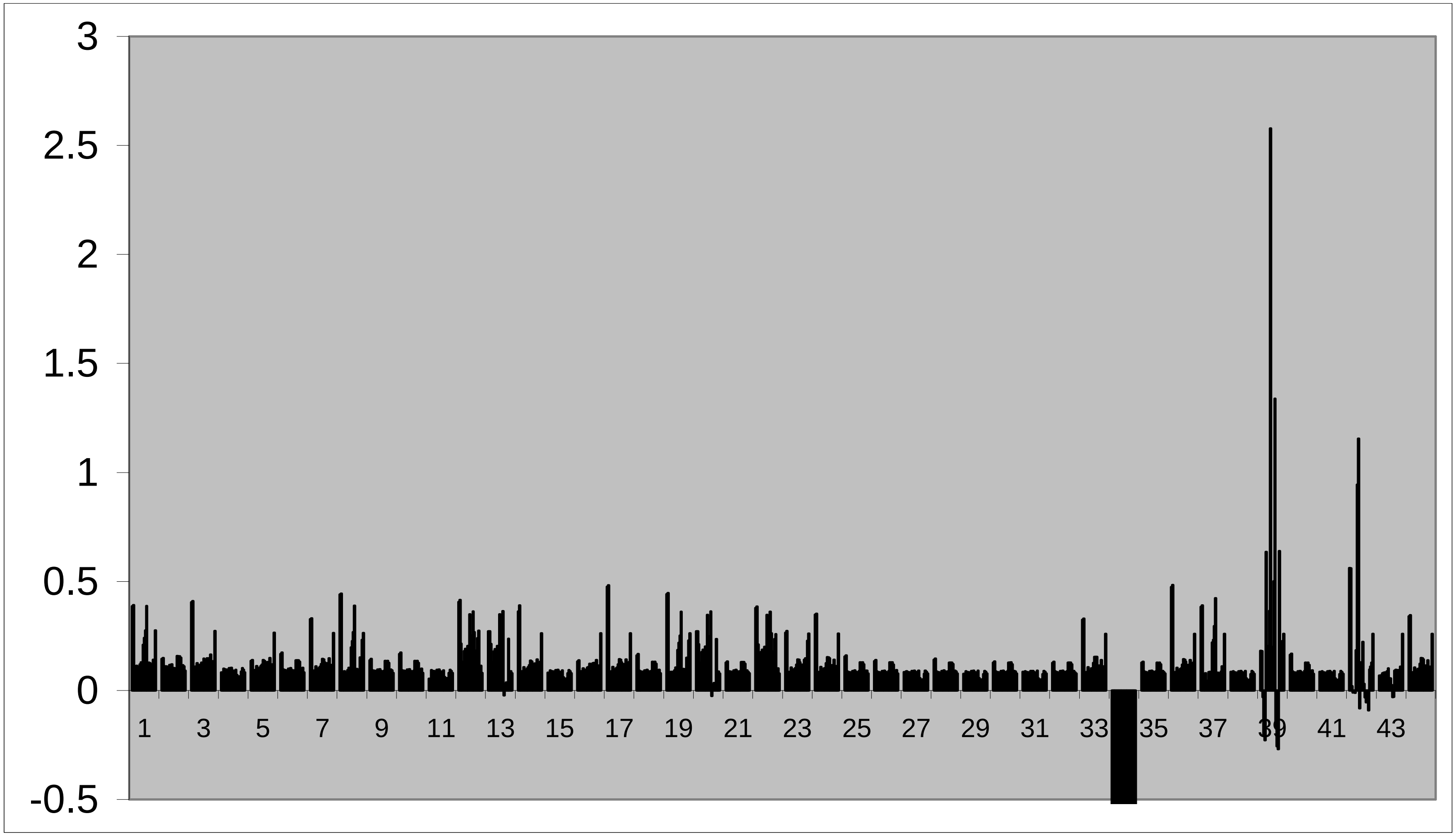


FIGURE C-33

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 35 (DOMINICK'S CRANAPPLE) OVER ALL 22 MODEL SPECIFICATIONS

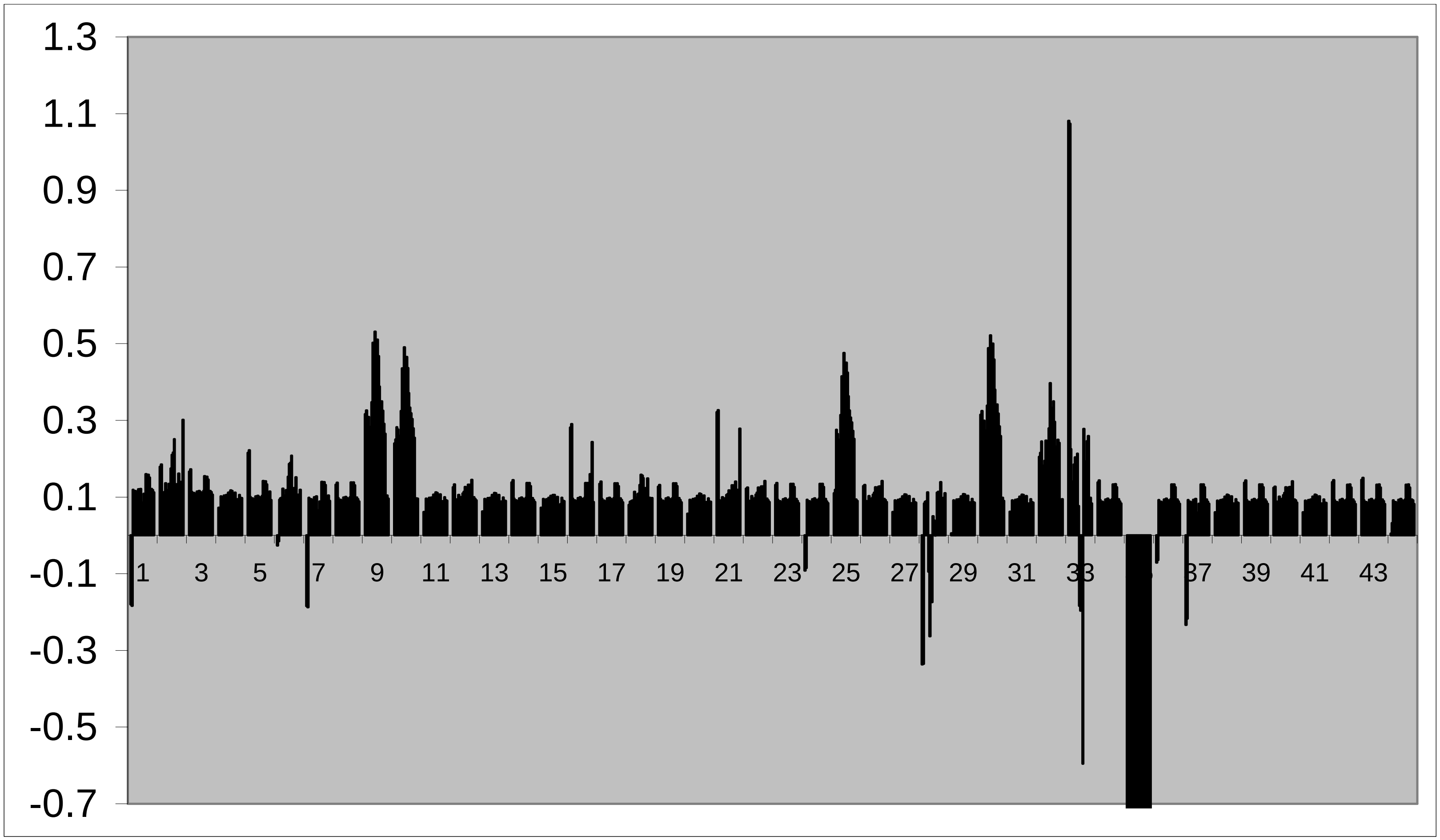


FIGURE C-34

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 36 (OCEAN SPRAY PINK GRAPEFRUIT JUICE) OVER ALL 22 MODEL SPECIFICATIONS

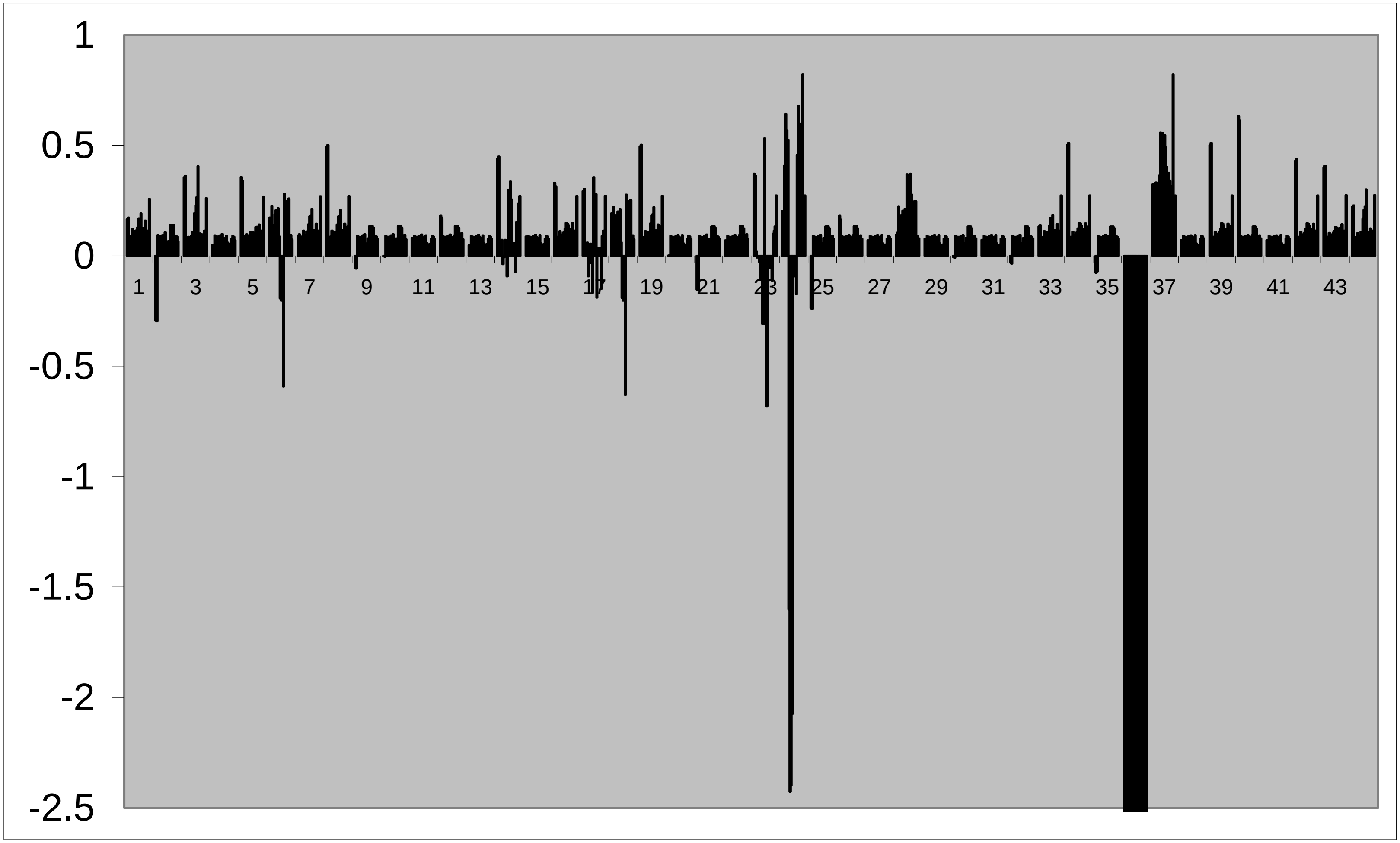


FIGURE C-35

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 37 (DOMINICK'S REGULAR GRAPEFRUIT JUICE) OVER ALL 22 MODEL SPECIFICATIONS

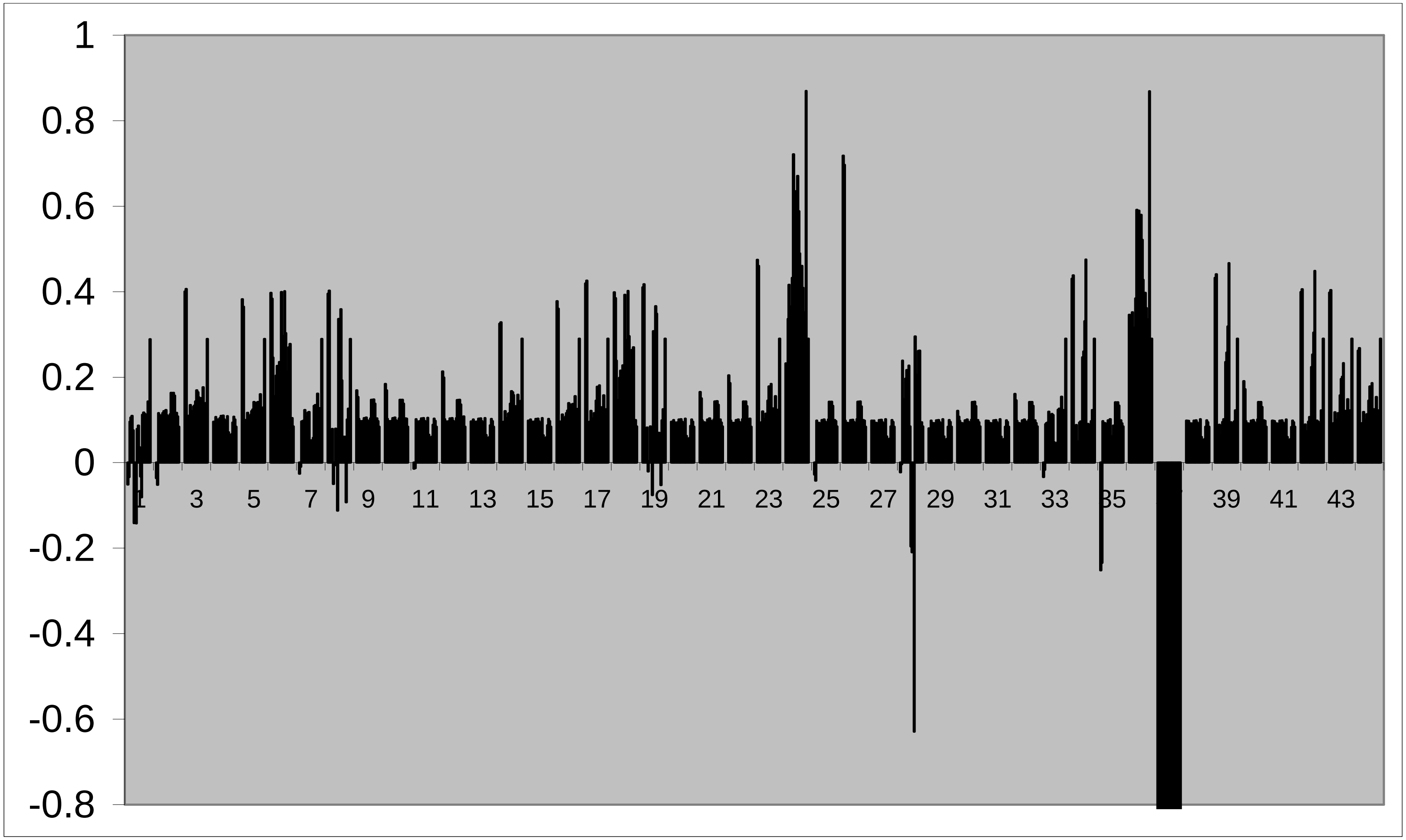


FIGURE C-36

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 38 (GATORADE LEMONADE) OVER ALL 22 MODEL SPECIFICATIONS

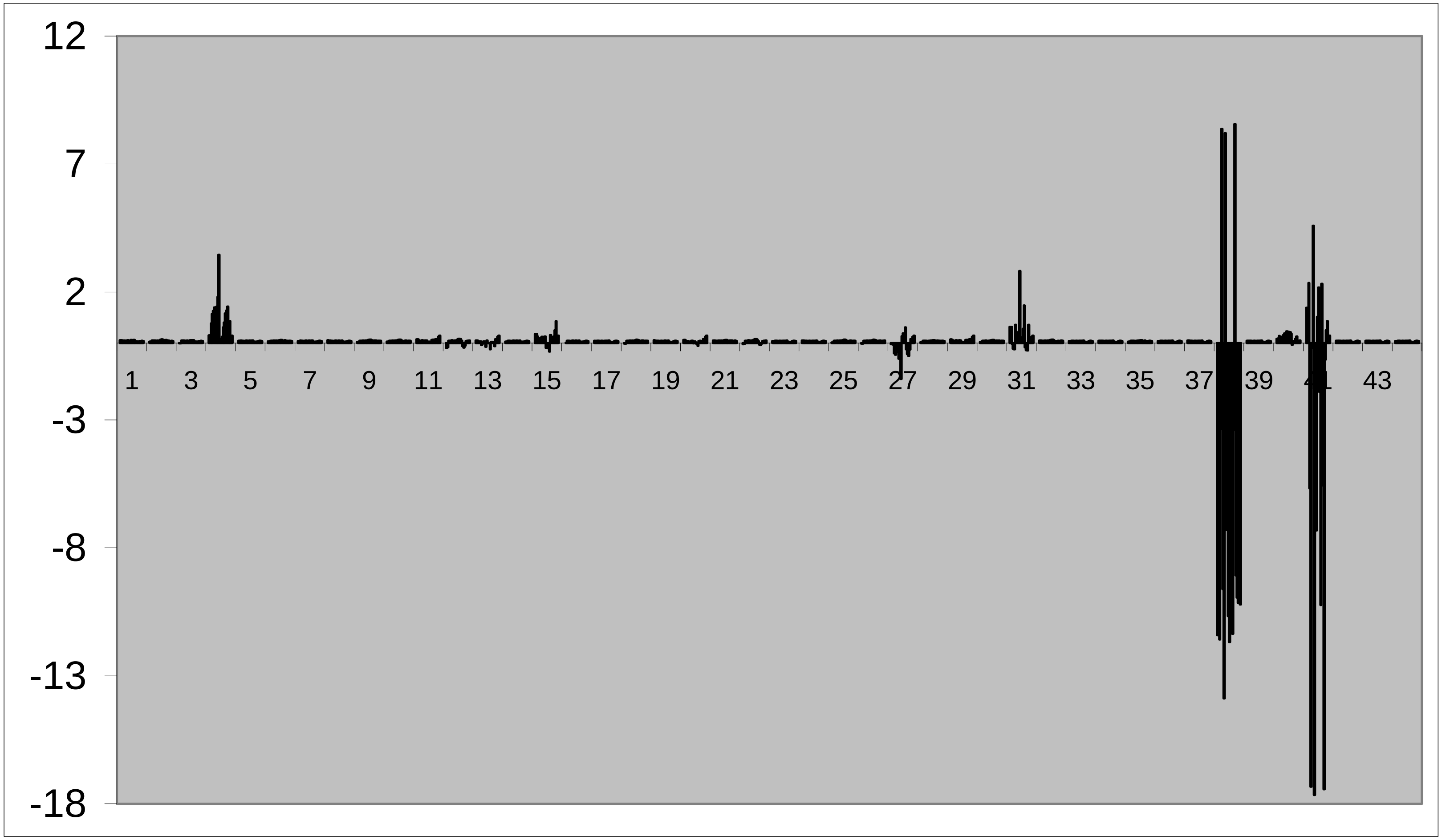


FIGURE C-37

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 39 (LIBBY BERRY) OVER ALL 22 MODEL SPECIFICATIONS

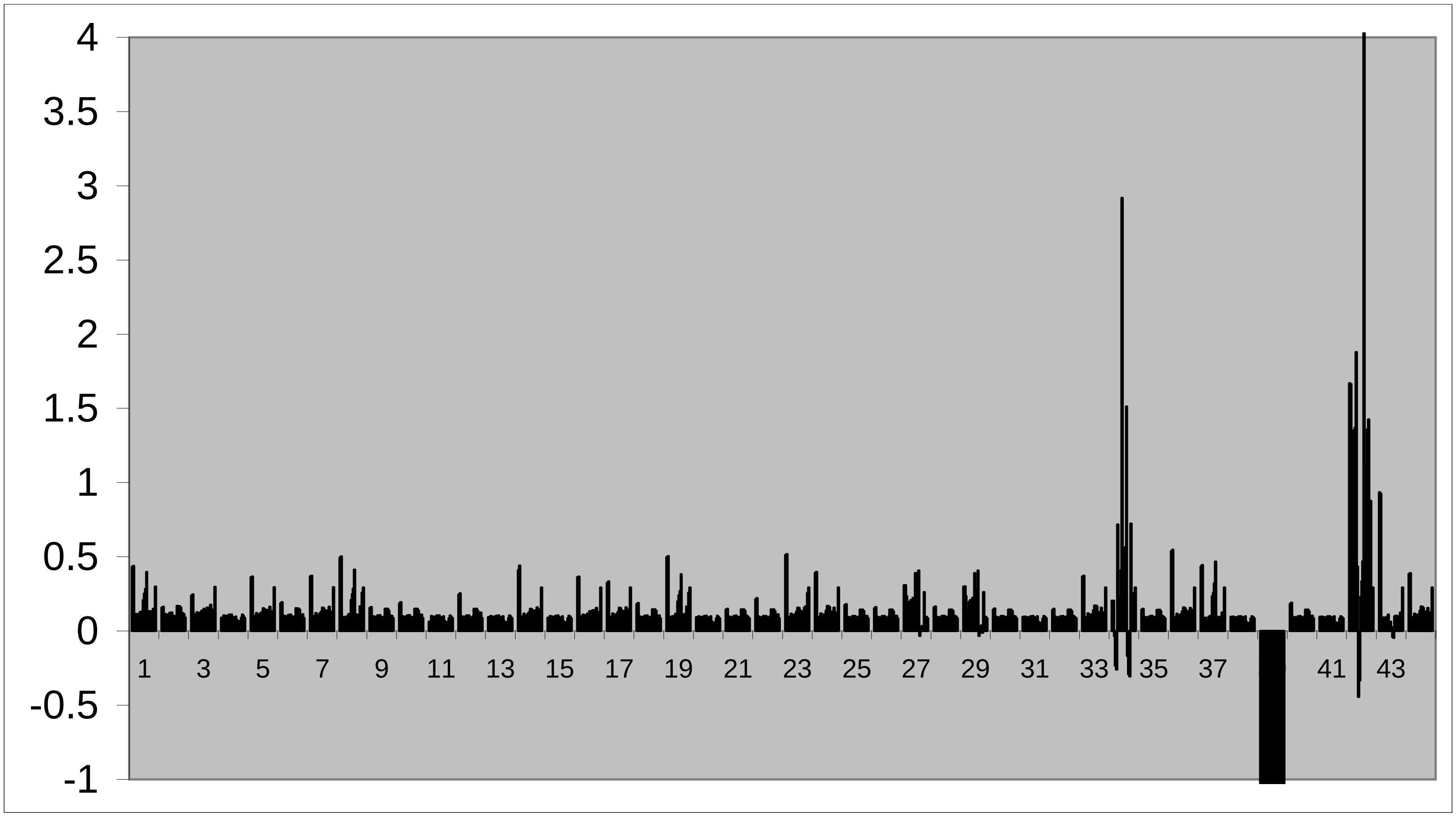


FIGURE C-38

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 40 (HI-C ECTO COOLER) OVER ALL 22 MODEL SPECIFICATIONS

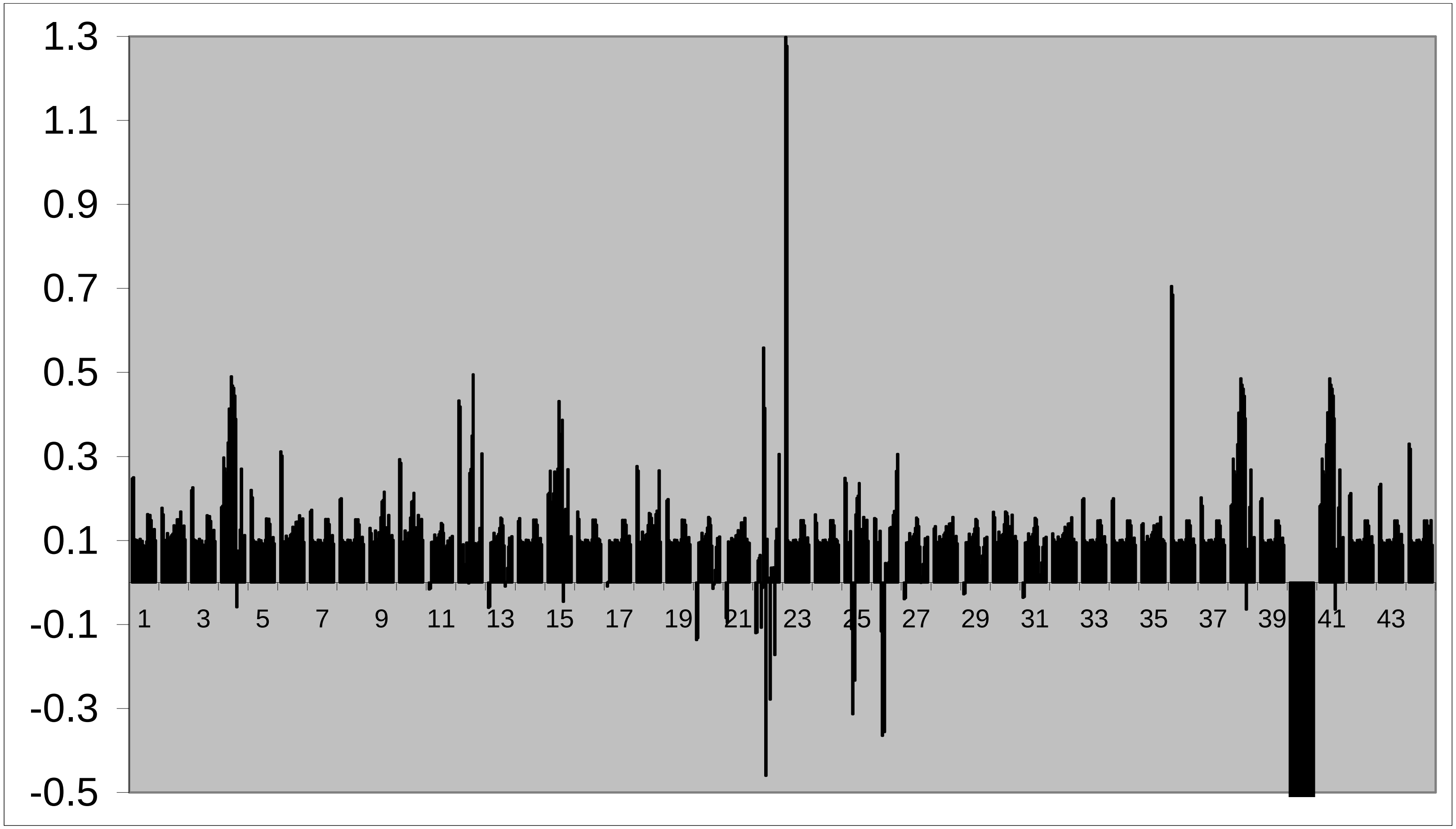


FIGURE C-39

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 41 (GATORADE CITRUS COOLER) OVER ALL 22 MODEL SPECIFICATIONS

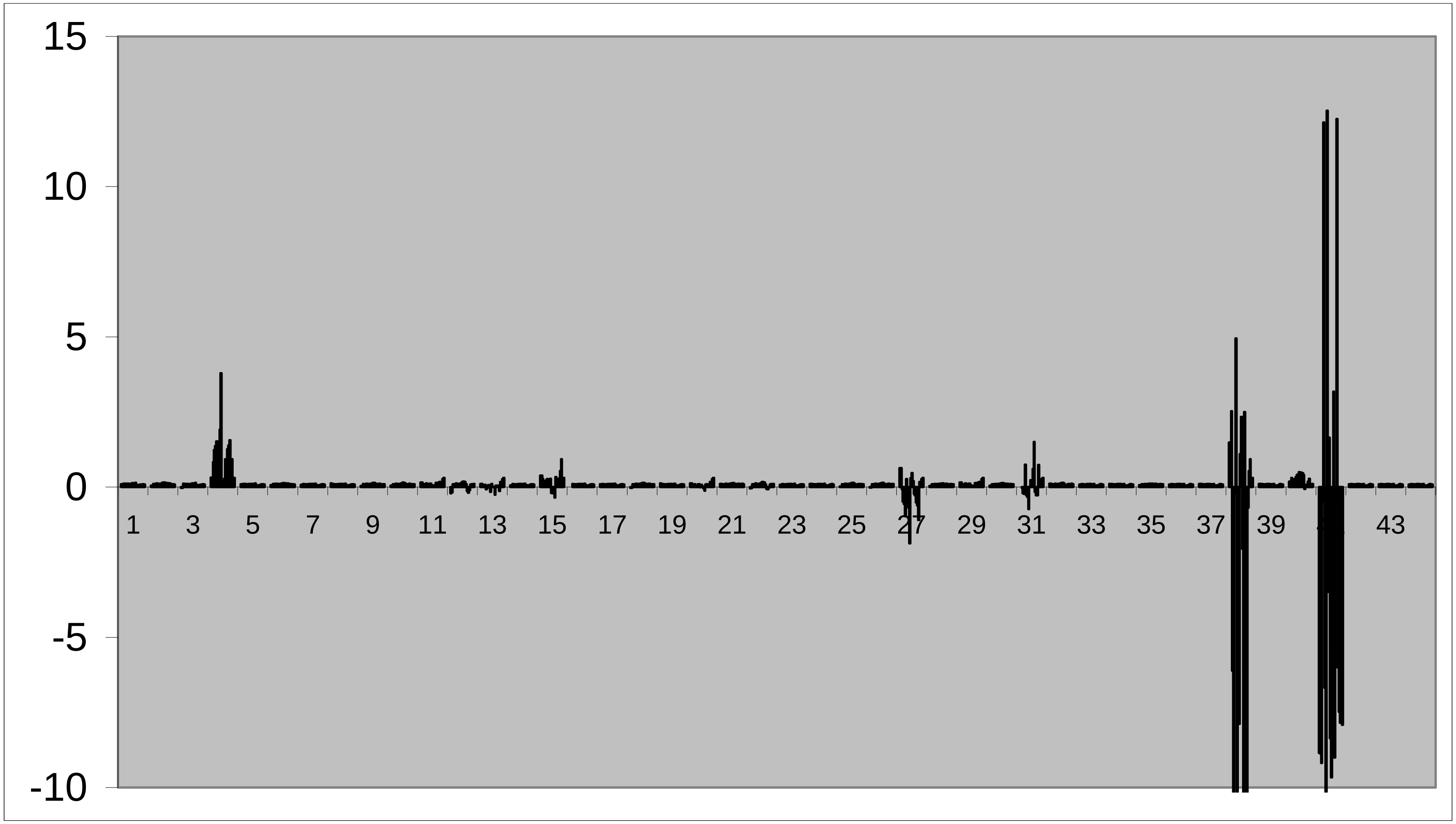


FIGURE C-40

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 42 (LIBBY CHERRY) OVER ALL 22 MODEL SPECIFICATIONS

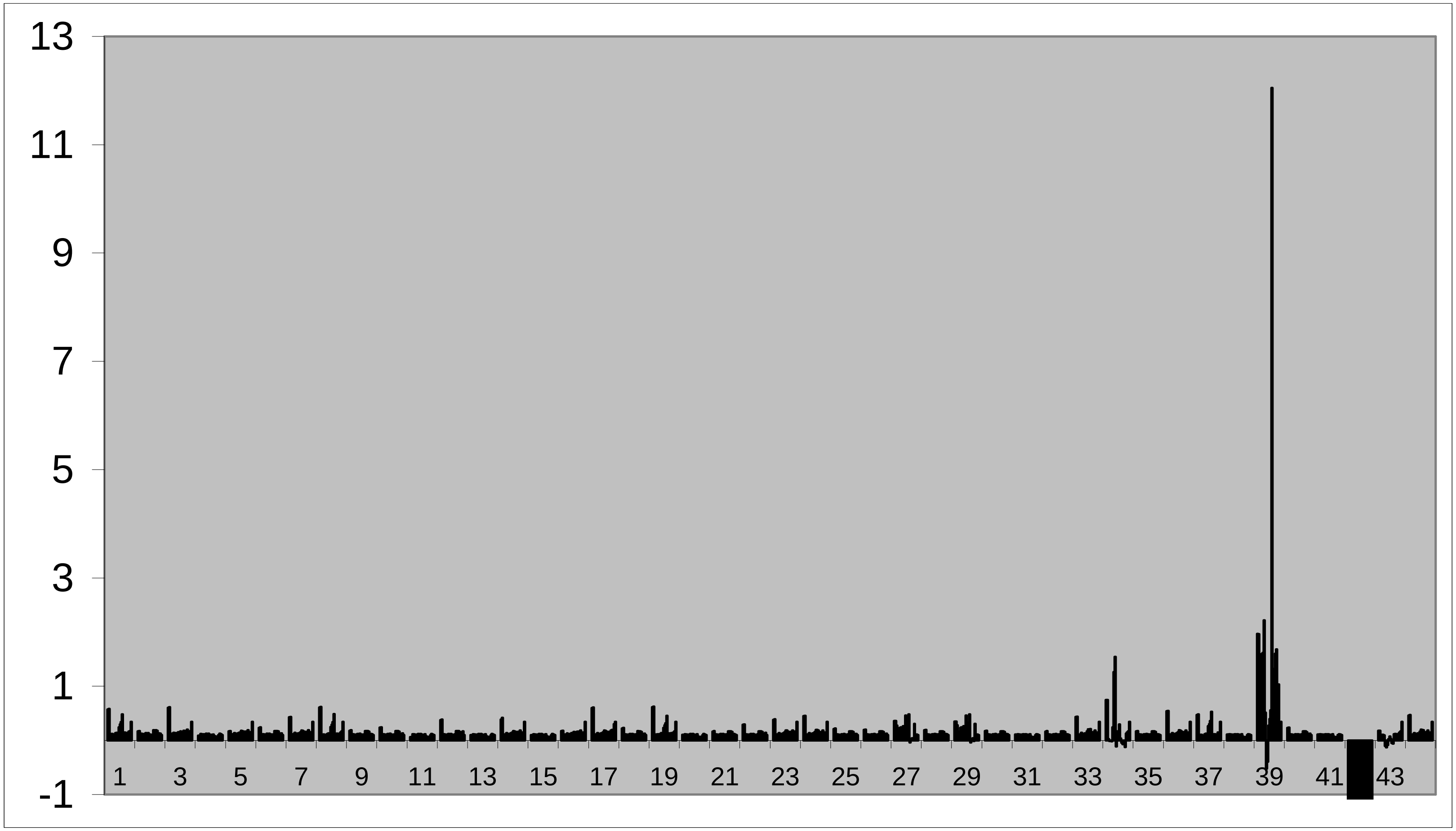


FIGURE C-41

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 43 (LIBBY GRAPE) OVER ALL 22 MODEL SPECIFICATIONS

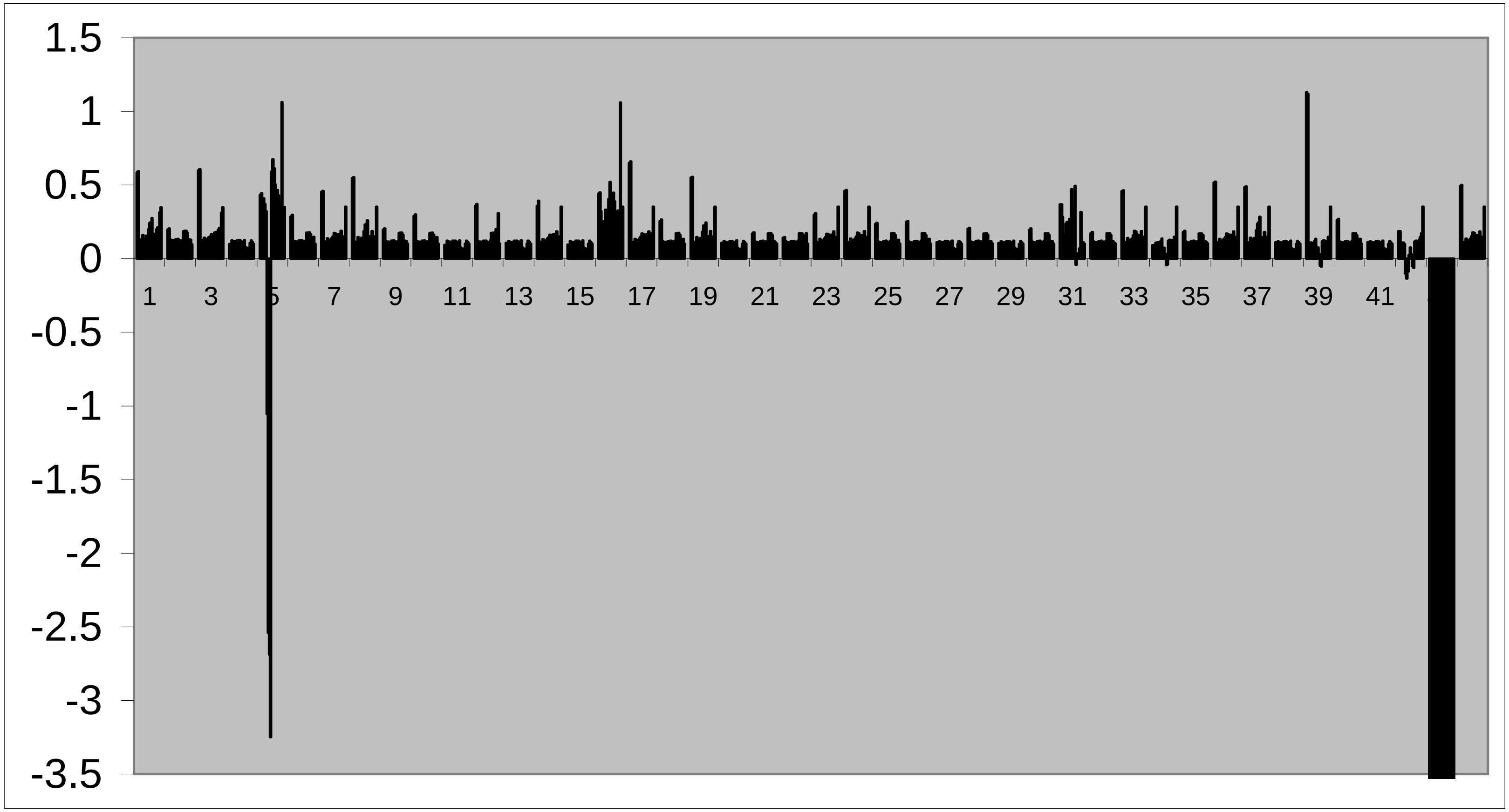
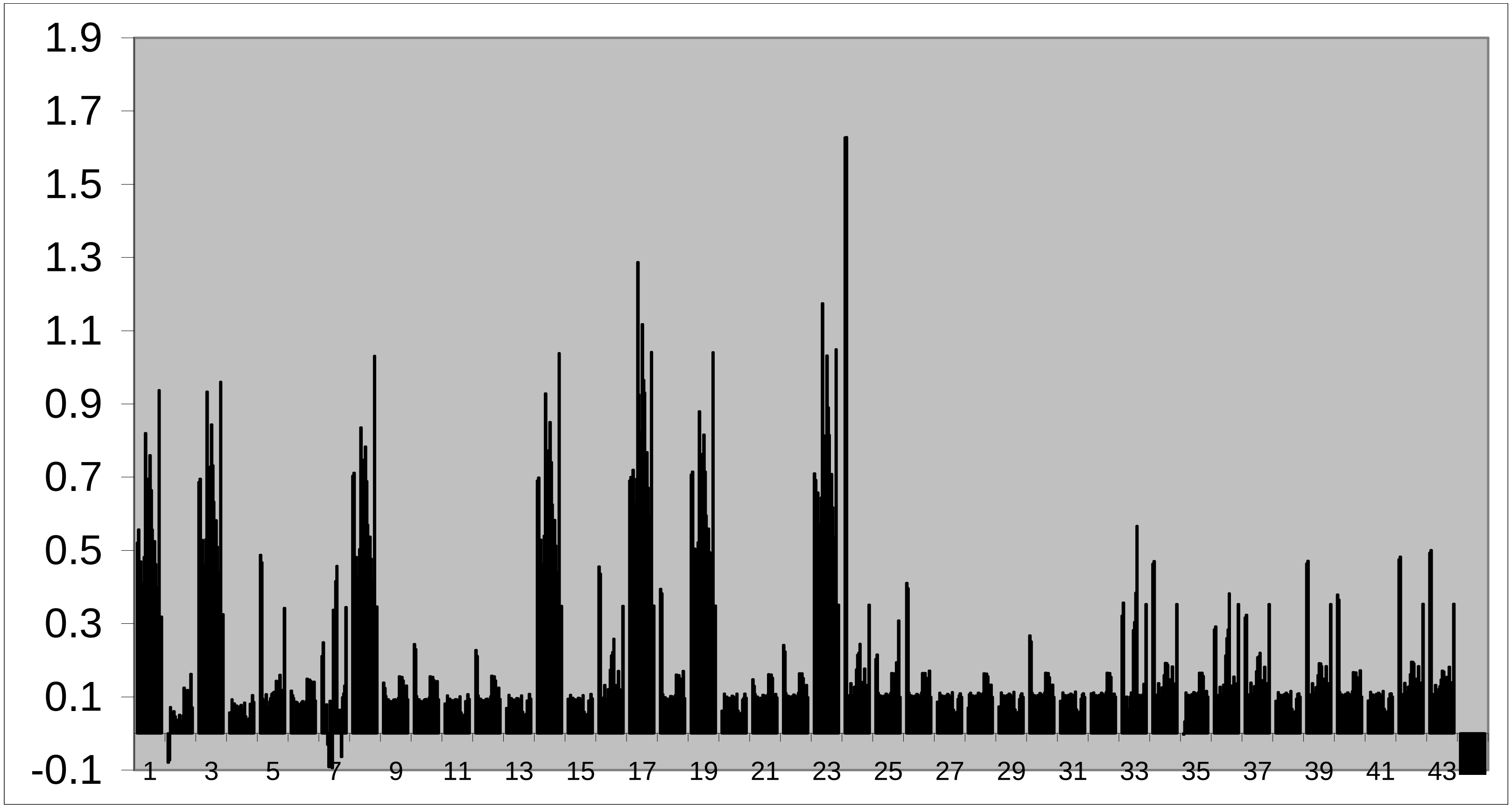


FIGURE C-42

UNCOMPENSATED DEMAND ELASTICITIES FOR PRODUCT 44 (VERYFINE APPLE JUICE) OVER ALL 22 MODEL SPECIFICATIONS



APPENDIX D

REPRINT PERMISSION LETTER FROM TAYLOR & FRANCIS FOR SECTION 3

Taylor & Francis
Taylor & Francis Group plc

2nd August 2006

Dear Geoff Pofahl

Thank you for your correspondence requesting permission to reproduce the following material from our Journal in your thesis.

Retail Zone Pricing and Simulated Price Effects of Upstream Mergers by Geoffrey M. Pofahl, Oral Capps Jr and H. Alan Love. International Journal of the Economics of Business 13(2), July 2006, pp. 195 - 215.

We will be pleased to grant entirely free permission on the condition that you acknowledge the original source of publication and insert a reference to the Journal's web site:

http://www.tandf.co.uk/Journals

Thank you for your interest in our Journal.

Yours sincerely

Sarah King
Directors' PA
UK Journal Permissions Manager
Taylor & Francis
4 Park Square
Milton Park
Abingdon
Oxon
OX14 4RN

UK Journal online permissions form:
http://www.tandf.co.uk/journals/permissions_form.asp?imprint=TF

Taylor & Francis Ltd
4 Park Square
Milton Park
Abingdon OX14 4RN
Tel +44 (0) 1235 828600
Fax +44 (0) 1235 829000
www.tandf.co.uk

Registered Office: 11 New Fetter Lane London EC4P 4EE
Registered No. 3215483

Routledge Taylor & Francis Group | Carfax Publishing Taylor & Francis Group | Spon Press Taylor & Francis Group

APPENDIX E

SECTION 3 PARAMETER ESTIMATES FOR LA/AIDS MODEL OF DEMAND FOR READY-TO-EAT CEREAL PRODUCTS

LA/AIDS Parameter estimates for all Chicago, Zone 1, and Zone 2

	All Chicago		Zone 1		Zone 2	
Parameter	Estimate	P-value	Estimate	P-value	Estimate	P-value
A1	-0.10556	[.742]	-0.11616	[.624]	0.041045	[.890]
C11	-0.63572	[.000]	-0.46679	[.000]	-0.82539	[.000]
C12	0.0659	[.067]	0.037898	[.213]	0.096086	[.012]
C13	0.080799	[.009]	0.052927	[.016]	0.106119	[.002]
C14	0.194561	[.000]	0.152813	[.000]	0.267074	[.000]
C15	0.099418	[.024]	0.043118	[.254]	0.139724	[.004]
C16	0.074749	[.006]	0.076203	[.002]	0.083302	[.005]
C17	0.06718	[.012]	0.047107	[.082]	0.077812	[.003]
C18	0.018597	[.419]	0.021975	[.307]	0.015983	[.484]
C19	0.017973	[.062]	0.014776	[.165]	0.022597	[.004]
B1	0.018066	[.404]	0.019603	[.295]	0.014147	[.542]
G1	1.21E-03	[.168]	1.69E-03	[.043]	3.56E-04	[.620]
G2	3.06E-04	[.707]	6.28E-04	[.419]	5.02E-05	[.940]
G3	-1.47E-04	[.857]	4.47E-04	[.566]	-5.63E-04	[.402]
RHO	0.158762	[.000]	0.171507	[.000]	0.158412	[.000]
A2	0.719575	[.003]	0.461529	[.016]	0.793097	[.000]
C22	-0.28767	[.000]	-0.25205	[.000]	-0.33038	[.000]
C23	-0.0184	[.509]	-3.28E-03	[.879]	-9.09E-03	[.740]
C24	0.12816	[.001]	0.107928	[.001]	0.130392	[.001]
C25	0.119873	[.004]	0.128762	[.001]	0.108343	[.006]
C26	-6.39E-03	[.816]	3.99E-04	[.988]	-4.87E-03	[.852]
C27	0.010961	[.680]	-1.69E-04	[.995]	0.013797	[.549]
C28	5.34E-03	[.828]	-6.71E-03	[.771]	0.019695	[.365]
C29	1.23E-03	[.905]	-2.36E-03	[.850]	-2.73E-03	[.709]
B2	-0.03464	[.037]	-0.02192	[.150]	-0.04556	[.002]
A3	0.256368	[.284]	0.141702	[.364]	0.29349	[.108]
C33	-0.16827	[.000]	-0.11412	[.000]	-0.22328	[.000]
C34	0.040744	[.259]	0.036147	[.171]	0.050971	[.178]
C35	0.03575	[.267]	9.22E-03	[.709]	0.046855	[.141]
C36	-0.01146	[.619]	-0.02344	[.233]	6.58E-04	[.977]
C37	0.015381	[.434]	0.016362	[.374]	0.011227	[.531]
C38	6.84E-03	[.698]	7.58E-03	[.607]	2.70E-03	[.869]
C39	5.32E-03	[.497]	7.62E-03	[.371]	5.31E-03	[.363]
B3	-0.01186	[.464]	-6.80E-03	[.583]	-0.01521	[.289]
A4	-2.54789	[.000]	-1.75528	[.000]	-2.54012	[.000]
C44	-0.40936	[.000]	-0.4152	[.000]	-0.42285	[.000]
C45	0.045479	[.385]	0.084212	[.086]	3.83E-05	[.999]
C46	-5.67E-03	[.839]	0.013402	[.642]	-0.01581	[.585]
C47	0.016541	[.472]	0.019915	[.439]	-3.56E-04	[.987]
C48	-1.18E-03	[.958]	7.94E-03	[.722]	-5.27E-03	[.804]
C49	0.02082	[.021]	0.02868	[.008]	0.01209	[.076]
B4	0.179313	[.000]	0.148417	[.000]	0.205806	[.000]
A5	0.739573	[.051]	0.622409	[.062]	0.853536	[.002]
C55	-0.40026	[.000]	-0.36694	[.000]	-0.41113	[.000]
C56	0.021497	[.482]	0.012069	[.676]	0.030997	[.311]
C57	0.033578	[.245]	0.045399	[.118]	0.043704	[.104]

C58	8.23E-03	[.764]	6.64E-04	[.979]	0.010283	[.700]
C59	2.76E-03	[.821]	0.013775	[.306]	9.42E-04	[.922]
B5	-0.0372	[.147]	-0.03244	[.220]	-0.05425	[.012]
A6	0.221728	[.205]	0.114593	[.483]	0.128159	[.338]
C66	-0.12658	[.000]	-0.13749	[.000]	-0.14489	[.000]
C67	6.92E-03	[.777]	0.01756	[.464]	8.51E-03	[.714]
C68	0.013254	[.506]	0.015788	[.393]	0.013325	[.497]
C69	0.019035	[.116]	0.013327	[.306]	0.017663	[.064]
B6	-0.01303	[.270]	-6.53E-03	[.613]	-8.71E-03	[.406]
A7	1.1153	[.000]	1.04019	[.000]	0.803263	[.000]
C77	-0.19204	[.000]	-0.17996	[.000]	-0.18236	[.000]
C78	2.90E-03	[.884]	-3.71E-03	[.851]	6.31E-03	[.734]
C79	0.024659	[.036]	0.033306	[.011]	0.01373	[.130]
B7	-0.06688	[.000]	-0.07015	[.000]	-0.05493	[.000]
A8	0.181334	[.197]	0.143674	[.248]	0.300374	[.002]
C88	-0.06942	[.003]	-0.05738	[.009]	-0.08305	[.000]
C89	4.59E-03	[.593]	9.75E-04	[.916]	9.42E-03	[.177]
B8	-8.09E-03	[.395]	-6.55E-03	[.506]	-0.01809	[.020]
A9	0.291592	[.000]	0.280845	[.000]	0.194069	[.000]
C99	-0.10757	[.000]	-0.12451	[.000]	-0.08479	[.000]
B9	-0.01933	[.000]	-0.02159	[.000]	-0.01467	[.000]

Note: the letter "A" corresponds to the alphas in equation (2), "B's" correspond to betas, "C's" correspond to gammas, "G's" correspond to marginal effects of quarterly dummy variables, and "RHO" is the AR(1) correlation coefficient.

VITA

GEOFFREY M. POFAHL

CONTACT INFORMATION	Department of Advertising, Public Relations & Retailing Michigan State University 309 COM East Lansing, MI 48824-1212	Telephone: (517) 353-9908 Email: pofahl@msu.edu

EDUCATION	B.S., University of Utah, May 2001 (with honors) Ph.D., Texas A&M University, December 2006
AREAS OF INTEREST	Applied Econometrics, Industrial Organization, Retailing Marketing, Scanner Data, & Demand for Differentiated Products
ACADEMIC EXPERIENCE	**Asst. Professor**, Michigan State University (August 06)
TEACHING EXPERIENCE	**Instructor**, Department of Agricultural Economics, Texas A&M University. AGEC 105 – "Introduction to Agricultural Economics," Summer 2005
PEER-REVIEWED PUBLICATIONS	Pofahl, Geoffrey M., O. Capps, Jr., & H.A. Love (2006) "Retail Zone Pricing and Simulated Price Effects of Upstream Mergers." International Journal of the Economics of Business. *Vol. 13, pp. 195-215.*
AWARDS & AFFILIATIONS	Tyrus Timm Graduate Fellowship, Fall 2002 – Fall 2003 Stiles Graduate Fellowship, Fall 2003 Texas Water Resources Institute Mills Scholarship Winner, 2003 American Marketing Association